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VIEWS, NEWS AND INTERVIEWS.

The yacht "Atmah," just built on the Clyde for Baron Edmond Rothschild, is said to be the most luxurious craft ever constructed. Her electrical equipment is complete and includes a telephone outfit with sufficient cable to connect the yacht with the local telephone exchange of any port she may be in.

The detachment of the Signal Corps of the Tenth Massachusetts Infantry, which came North on the "Seguranca", and has been at Governor's Island since the arrival of the transport, has been ordered into camp at Huntsville, Ala. There are 29 men in the detachment. The order was not altogether a welcome one. The men are all skilled telegraph operators, and some of them have valuable jobs waiting for them in Boston. Now that the war is over they want to go home, and some Massachusetts Congressmen, it is said, have been working to get the corps mustered out.

At noon on August 17, Governor Adams turned on the current by which hereafter the gold mines of Cripple Creek, Colo., will be run and lighted. Steam will be entirely replaced in all the leading mines by electricity generated at Cañon City, 24 miles south of the camp.

An electrolytic method of producing iodoform has been invented, and is said to yield very satisfactory results. The apparatus consists of an ordinary battery-jar, closed with a plate of india-rubber, and containing three platinum plates or electrodes. The middle one, which is about 85 square centimetres in surface, serves as the anode, and the cathodes are wrapped in parchment paper. Between the electrodes were placed two entrance tubes for gases and an exit tube. A copper and a gas voltmeter were in circuit. The charge consisted of a solution of potassium iodide, sodium carbonite and alcohol, the whole being kept at a temperature of 65 degrees by a water bath. The iodoform was removed every eight ampere hours, and the corresponding amount of iodide of potassium and 20 cubic centimetres of alcohol added. A slow current of carbon dioxide is passed through the cell to take up the caustic potash formed at the cathode.

A new cable between Germany and Sweden, the joint property of the German and Swedish governments, is to be laid in the Autumn. The contract for the manufacture of the cable has been awarded to the firm of Felten & Guilleaume, for about $70,000.

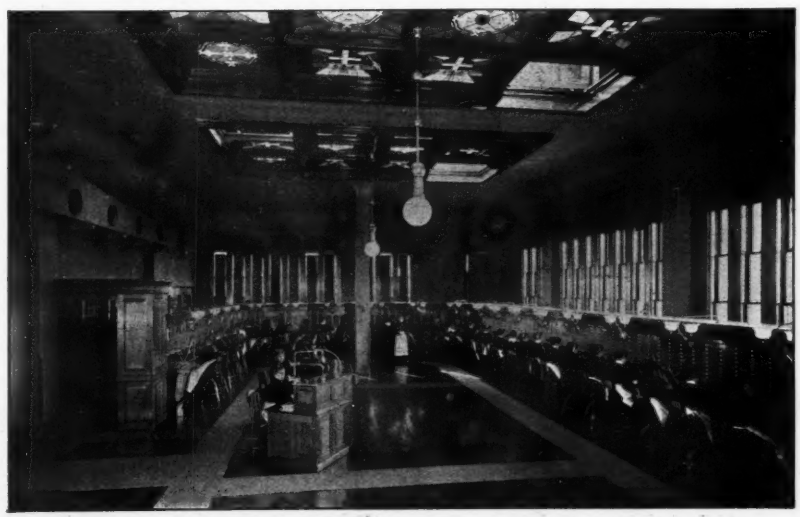


FIG. 1.—THE CLEVELAND TELEPHONE COMPANY—OPERATING ROOM, MAIN EXCHANGE.

Mr. Dubois, of Berne, says an exchange, recently presented a note to the Académie des Sciences on the duration of the variable period of current flow when a potential difference is applied to the human body. He used a condenser connected to a battery through the resistance to be compared, and then made the circuit for a very short period by the fall of a steel pencil against a mass of steel. In this way the circuit was broken before the steady state was reached, and, by measuring the charge on the condenser, one point of the curve of rising pressure could be obtained. From this and the fixed potential difference the period of variable flow of current can be obtained. From comparative experiments, the author concludes that the human body, during the period of variable current, presents a reactance much smaller than the ohmic resistance. In fact, its capacity partially annuls the resistance. The resistance, however, of the body, during the period of variable current, is constant. The resistance increases with the length of the parts of the body in circuit, and depends also on the surface of the electrodes. Finally, he concludes that the body acts as a condenser with a liquid dielectric, having a capacity equal to about 0.165 microfarad.

The ELECTRICAL REVIEW, of New York, observes the London *Electrical Engineer*, gives a picture of the seven lady conductors of the Chillicothe tramway. It seems from the description that there were 100 applicants for the seven posts, and that "personal attractiveness" was the subject of the competitive examination by which these candidates were reduced to seven. The result is a pleasing group of conductoresses, and a 30 per cent increase in the gross takings of the tramcars. As they can marry the passengers the remaining 93 may have a chance.

THE CLEVELAND TELEPHONE COMPANY.

THE MOST MODERN TELEPHONE EXCHANGE IN THE WORLD ILLUSTRATED AND DESCRIBED—UP-TO-DATE APPARATUS IN EVERY DEPARTMENT.

Every man of affairs to-day is a user of the telephone, and a constant user at that, but only a very small proportion of users and subscribers have any conception of the equipment and operation of a telephone exchange. A subscriber who recently visited a large exchange said: "I have been a user of the telephone for nearly 20 years, but in the wildest flights of my fancy I could not conceive what the exchange looked like. In fact, with many other subscribers, I have become so accustomed to the telephone that it never occurred to me to think of its operation, or the fact that an elaborate piece of mechanism was required to handle the volume of business transacted over the wires."

A subscriber orders a telephone, sees the inspector place the instrument in his office or residence, uses the instrument whenever he has occasion to communicate with other subscribers, and knows that several thousand other subscribers are in constant communication with each other. There his fund of information ends, unfortunately both for him and for the telephone company operating the exchange with which his line is connected. Of late years the telephone companies, appreciating the practical value of having their subscribers understand the workings of the exchange, have made special effort to induce subscribers to visit the exchange, study the mechanical arrangements, watch the operating and become familiar with several of the most complex problems connected with the operation of a large plant. These visits have had a double value. In the first place, they have taught the subscriber the possibilities of the telephone and opened his eyes to the fact that his individual co-operation is of

the greatest value to the telephone company. In the second place, they have removed from the subscribers' mind half a dozen fallacies regarding the handling of calls. In the third place, they have pointed out to the subscriber the limitations of the telephone.

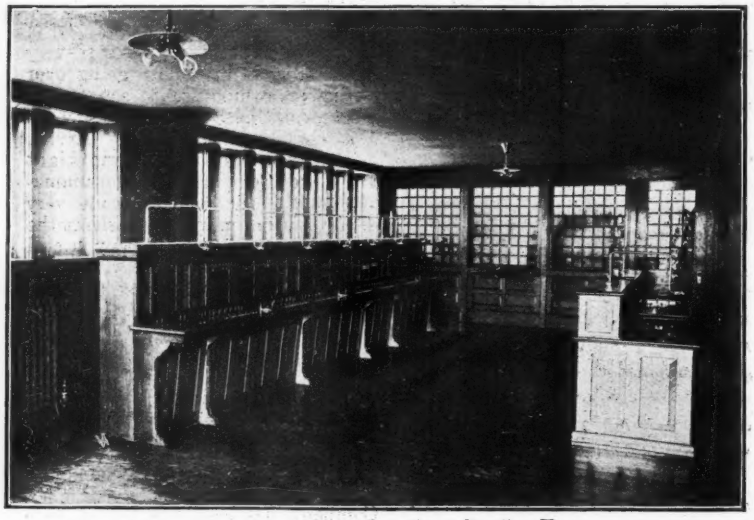


FIG. 2.—THE CLEVELAND TELEPHONE COMPANY—LONG-DISTANCE ROOM.

Probably the two most common complaints in the telephone exchange are regarding the reports by operators that "the line is busy" and "they don't answer." A subscriber who has visited the exchange and studied its operation realizes, possibly for the first time in his life, that when his operator has answered his telephone she has done about four-fifths of the work necessary to make a connection, and that it is much simpler for her to make the connection than to report the line busy and have to go through the same motion again a few moments later. As regards the report "they don't answer," a subscriber learns that a very large number of subscribers are extremely indifferent as to the promptness with which their telephones are answered, so that a great deal of the complaint regarding slow service and reports of "they don't answer" is due, not to the exchange, but to the delay or indifference of the subscriber called for.

The Cleveland Telephone Company, of Cleveland, Ohio, early in the year completed the re-equipment of its various exchanges, and, upon the completion of the new Main exchange, issued invitations to all of its subscribers to visit and inspect the exchange. The invitations were distributed over a period of six or eight weeks, during which time upwards of 6,000 people took advantage of the opportunity to see the workings of the telephone system. Inasmuch as the Cleveland Telephone Company's new exchanges are all equipped with relay boards, the calling and disconnecting signals all being given automatically by means of incandescent lamps, the demonstration of the handling of calls was much simplified. The accompanying picture of a section of the switchboard gives some idea of the arrangement of subscribers' lines. The subscribers' lines are brought to tiny incandescent lamps, which, in the illustration, are the white dots about an inch from the bottom of the picture. When a subscriber takes his telephone off the hook, the lamp corresponding to his line lights up, and the operator answers him with one of the small plugs ranged vertically just below the rows of lamps. These plugs are on the ends of cords used for making connections, there being a pair of cords forming a practically continuous line for each connection. The operator answers with a plug on one of these cords, switches in on the line, asks the number wanted and inserts the other plug of the pair in the spring-jack of the number called, first touching the tip of her plug to a ring, forming one of the contacts of the spring-jack, to ascertain whether the line is in use. If the line is in use the operator gets a distinct click in her ear and reports the line busy, otherwise she makes connection and rings by means of a lever or key connected with the cords. On the horizontal key-board, shown in the picture (see Fig. 3), are incandescent lamps used for disconnecting signals. These lamps are connected with the cord, and only light when the corresponding telephones are on the hook. In other words, when the operator has made the connection, the lamp corresponding to the line called lights up and stays burning until that subscriber takes his telephone off the hook to answer the call. The disconnecting lamps remain unlit until the conversation is through, when, upon both telephones being hung up, they light up, thus giving the operator the signal to disconnect.

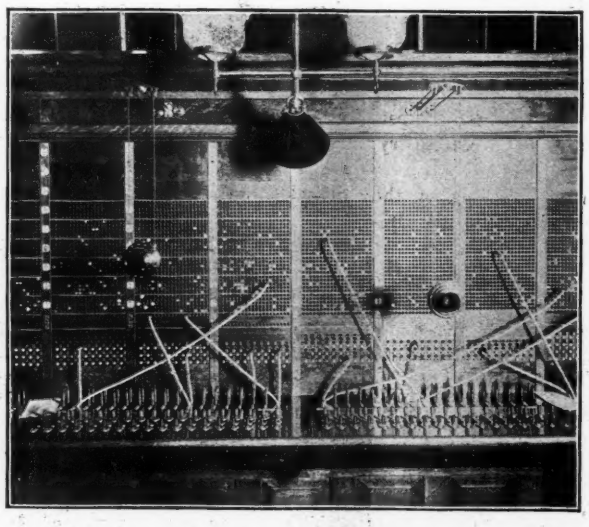


FIG. 3.—THE CLEVELAND TELEPHONE COMPANY—SECTION OF SWITCHBOARD.

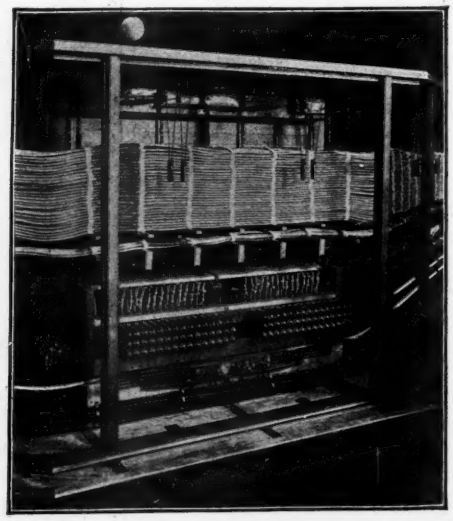


FIG. 4.—THE CLEVELAND TELEPHONE COMPANY—SECTION OF SWITCHBOARD, REAR VIEW.

The switchboard in the Cleveland Telephone Company's main exchange was built by the Western Electric Company, its planning and construction covering a period of nearly three years. It is located in a large, well lighted and finely finished room in the company's own building. It is divided into 25 sections, two operators to each section, and has a capacity of 5,400 subscribers, its present equipment being for 3,600 subscribers. Some idea of the detail involved in the construction of this board may be gained from the fact that each subscribers' line requires three wires, two for the circuit and one for the automatic busy test, carried around the entire length of the switchboard, with taps at each section to enable the operators to reach the line without calling in any other operators. There being 3,600 lines of three wires each to be carried through the multiple, there are a total of 10,800 wires in this bunch of cable alone, and, as each line is taken to 25 sections, there are a total of 270,000 connections from this cable to the switchboard, each connection going to a spring-jack. The wiring in the switchboard and adjoining rooms involves a total of over 4,000 miles of wire and 800,000 soldered connections. The main switchboard cost a trifle over $100,000, and the switchboards in the East, West and Doan exchanges cost as much more, so that the total expense of the re-equipment for the city of Cleveland amounted to something over $200,000.

The accompanying diagram shows the volume of business handled during an average working day. This diagram would be materially changed by weather conditions. The records from which it was made were taken on a clear day. On a stormy or rainy day the volume of business handled through the exchange would be much greater, owing to people staying at home or in their offices and using the telephone in preference to going out. A total of over 100,000 calls are handled in the Cleveland exchange daily, the number having quadrupled since 1890. The number of sub-

scribers in 1890 was approximately 2,500, while the number of calls amounted to 25,000. With 5,700 subscribers, the number of calls has increased more than fourfold, the average number of daily calls per subscriber increasing from 10 in 1890 to nearly 20 in 1898. This increase is due partly to the growing popularity of the telephone as a means of transacting business, and partly to the fact that with a larger number of subscribers the number of possible combinations is greatly increased, that is, that any one of the 5,700 subscribers is more apt to make use of the telephone when he can reach 5,700 subscribers than in an exchange where a subscriber can only reach 2,500 others.

The Cleveland company's equipment auxiliary to the switchboard is fully up to date. The distributing frames and cable terminal are in the basement, from which point the wires are taken up a shaft to the sixth floor, where they are carried through the intermediate distributing-board and run through the relay and cut-off-relay circuits before being taken into the operating-room. On the sixth floor is also located a complete power plant, consisting of two generators, used for charging storage batteries, each two horse-power; a three and one-half horse-power generator for lighting the signal lamps, two one-quarter power generators for ringing, and 42 cells of storage battery. There is a very complete power switchboard equipped with six ammeters, three of them recording, and two voltmeters. Each of the three branch exchanges has a similar equipment.

Adjoining the operating-room in the main exchange is the long-distance room and switchboard, with positions for 10 operators. Through this board can be reached about 8,000 towns and cities throughout the United States, establishing direct communication with two-thirds of the people of the country.

The company has made ample provision for the comfort of its operators, the entire seventh floor being given over for their use. A pleasantly arranged lunch-room, with kitchen and pantry attached, a lounging and reading-room, lavatory and bath-room make the quarters of the operators as convenient as anything of the sort in the city.

The officers of the progressive Cleveland Telephone Company are as follows: president, Chas. J. Glidden; treasurer, Chas. A. Grant; secretary, Geo. B. Perham. Directors: Chas. J. Glidden, W. J. McKinnie, Col. Wm. Edwards, E. P. Williams, Jno. E. Hudson, Gen. Thos. Sherwin, A. B. Hough and J. P. McKinstry. Mr. J. P. McKinstry, vice-president and

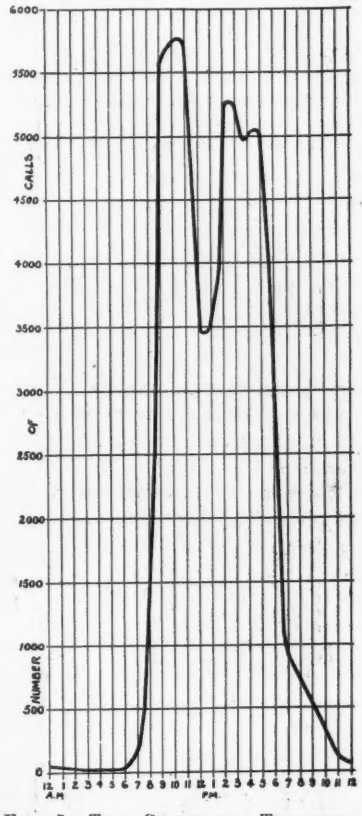


FIG. 5.—THE CLEVELAND TELEPHONE COMPANY—DIAGRAM OF A DAY'S BUSINESS.

general manager; P. Yensen, superintendent, and C. T. McKinstry, manager.

Referring to the working of the new system, General Manager McKinstry says: "Our main board has been in operation since January 9, and the branch exchanges have been in use at least five months. I can only say that we are highly pleased with the system and that it has come up to all of our expectations. In fact, the system has done more to improve our operating and service than we expected. Our subscribers not only get more prompt service, but a better quality of service in every way, and in general the re-equipment of our plant has given most satisfactory results in our endeavor to place and maintain the telephone service of Cleveland at the highest point of efficiency."

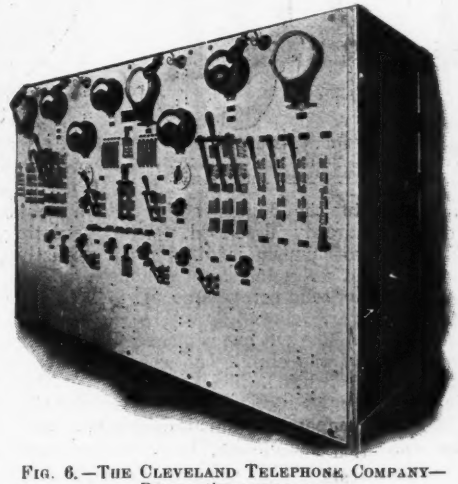


FIG. 6.—THE CLEVELAND TELEPHONE COMPANY—POWER SWITCHBOARD.

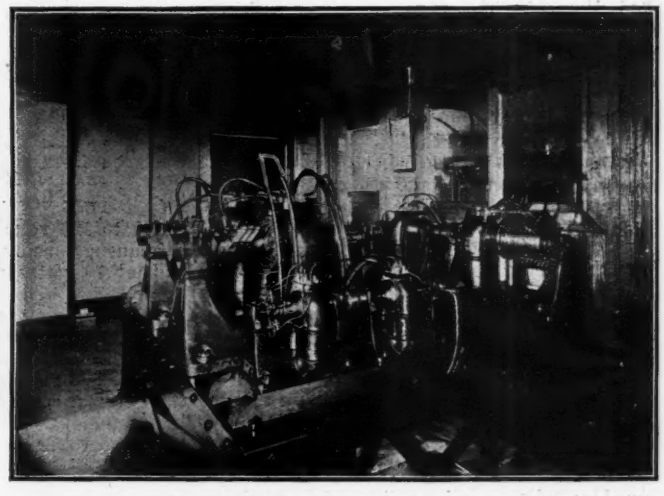


FIG. 7.—THE CLEVELAND TELEPHONE COMPANY—POWER ROOM.

Ohio Electric Light Association.

The Ohio Electric Light Association held its fourth annual convention at Sandusky, Ohio, on August 18 and 19. A large number of delegates and visitors was present. President H. K. Wood, of Piqua, Ohio, presided. Among the papers read were the following:

"Positive and Negative Economies in the Operation of Small Electric Light Plants," by E. P. Roberts; "Some Suggestions Relative to Determining the Cost of Electrical Supply," by M. E. Turner; "The Meter's Relation to the Dividend," by Caryl D. Haskins; "Comparative Commercial Qualities of Old and Modern Transformers as Applied to an Exchange," by J. H. Perkins; "Long-Distance Transmission of Power," by E. J. Berg. A question box was opened and the queries propounded were answered in a general discussion.

The officers for the ensuing year are as follows: President, Emil C. Schmidt, Sandusky; vice-president, B. P. Holmes, Youngstown; secretary and treasurer, Samuel Scovil, Cleveland. The next convention of the association will meet at Cleveland, the time to be announced by the executive committee.

FINANCIAL NEWS.

Electrical stocks remained strong during the past week. General Electric closed at 41, Western Union at 94¾, Edison Illuminating, New York, 133¼; Edison Illuminating, Brooklyn, 130.

In Boston, Bell Telephone closed at 283½, Erie Telephone at 74½.

The lawyers have been going over the papers which are to convey the property of the Edison Electric Illuminating Company of Brooklyn, N. Y., to the Kings County Electric Light and Power Company, and consummation of the sale will be made very soon. In the opinion of insiders the stock of the Edison company is still selling below its value, notwithstanding the advance in the past 60 days.

PERSONAL.

Mr. Thomas V. Hall is now representing the Fort Wayne Electric Corporation in the state of Texas, and is making his headquarters in the Scollard Building, Dallas.

Mr. F. E. Drake, of the Walker Company, has been selected as electrical adviser to commissioner-general Ferdinand Peck, of the United States, to the Paris Exposition of 1900. Mr. Drake will sail for France with the commissioner-general and party on the steamer "La Touraine" from New York on September 3. He expects to return to this country about the middle of October, and will then resume his duties with the Walker Company.

The death of the courageous young "Rough Rider," Wm. Tiffany, is one of the most distressing incidents of the war. Distressing because it seems to all his friends a useless sacrifice, brought about by incompetency and lack of care, after his splendid service at El Caney, where he had been raised in rank for his bravery. Mr. Tiffany was known in the street railway field as being vice-president of the Sterling Supply and Manufacturing Company, of New York.

The Sterling Arc Lamps.

The Sterling Arc Lamp Company, of New York city, are the manufacturers of the arc lamps illustrated herewith. This company's so called "universal mechanism" which, with slight modifications, is used in all their lamps, is claimed to be the highest development of simplicity in design and operation.

The regulating mechanism is of a new clutch chain-feed type. The upper carbon-holder consists of a cross-bar sliding between the two frame rods, with a carbon lamp centrally attached. Immediately above, the feed-chain is connected and passes thence over the toothed-clutch pulley in the mechanism. The chain is kept taut by means of a small weight attached to the other end and moving in one of the hollow frame rods. In renewing the carbons, it is simply necessary to unscrew the outer globe-holding cup at the bottom of the lower carbon-holder, and then, by loosening the screws of the upper and lower clamps, the carbons are readily passed through the hollow lower holder, and new carbons inserted without removing or in any way disturbing the globe. The upper carbon is also readily removable owing to the flexible feed-chain support. This chain is not used for current carrying, but a separate conductor serves for this purpose.

The movement of the feed-chain and its attached upper carbon is controlled by the clutch pulley over which the chain passes. This pulley is suitably pivoted in a projection from the mechanism base, and the control magnet operates on a pivoted clutch or brake-bar causing the chain pulley to be gripped by the clutch member, turned the necessary distance, and carrying the carbon correspondingly. This clutch pulley is practically the complete regulating mechanism in all of the Sterling lamps. The inner globe is supported in a cup-like metal holder, fastened to the lower end of the frame rods. This support also serves as the clamp for the lower carbon. The inner globe is simply set in the holder and held in position by means of a cross-bar and cap, sliding between the two frame rods, and suitably held down upon the top of the enclosing globe, so that the latter is firmly and securely clamped in position, but can easily be removed by simply raising this cap bar. In the construction of the globe cap, forming part of this bar, no moving parts whatever are used. It is claimed that owing to the construction of the upper sliding-bar carbon-holder, perfect alignment is always maintained without the use of auxiliary mechanism in the globe.

The constant-potential lamp burns singly on 110 to 120-volt circuits, using about four and one-half to five amperes and 80 volts. The clutch mechanism consists of a chain brake around the feed-chain pulley, and is attached to the operating bar, so that movement is imparted to both ends of the chain when the bar is actuated. This clutch or brake-chain operates as a bank brake with both ends movable. By means of this arrangement it is insisted no motion whatever of the regulating cores is lost, as the slightest movement of the latter grips the feed-chain pulley and any further movement is imparted to the carbons. The lamp is adjusted by means of a stop pin regulating the movement of the brake-chain bar. No springs are used.

The Sterling alternating lamp burns singly on 100 to 120 volts at 60 or 125-cycles frequency, using six amperes and about 70 volts, and burns from 80 to 100 hours with one trimming. One of the claims made for this lamp is that it consumes only 425 to 450 watts. A regulating reactive coil on the lamp is so arranged, that by changing the connections on the coil the lamp may be adjusted to any frequency and voltage. The regulating coils are double series, connected with reactive coil, and acting on double laminated iron cores attached to the bar. Coil spools and other metal parts adjacent to the coils are of non-metallic material. The switch for opening the circuit is on top of the lamp. The clutch mechanism is the same as in the constant-current series lamp, it being claimed that by reason of the particular delicacy of this mechanism and the absence of lost motion, the carbons are fed together without the usual jump and burn without flicker.

In the Sterling enclosed series lamp the clutch-wheel parts are slightly modified to meet the extremely hard usage to which this class of lamps is at times subjected. The feed-chain wheel is clutched by a novel-form of clutch device, which works similarly to the double-acting chain brake already described. The regulating mechanism is differential, consisting of series and shunt double coils acting on solid cores connected to the clutch bar.

The cut-out is operated by the end of the clutch bar when the carbons are all fed. This cut-out switch seems to be particularly substantial, being, in fact, a well made double-pole knife-switch, cutting in a low-resistance loop around the lamp terminals.

No springs are used for adjustment, the lamps being regulated by means of a stop pin as in the multiple lamps. The lamp switch or line cut-out is a decidedly new feature which is claimed to possess advantages found in no other similar device, as it altogether eliminates all possibility of danger to the lamp trimmer. This switch is in a separate case, which is hung from the supporting hook, and consists of a double, centrally pivoted knife-blade switch operated by a suitable handle, so that the lamp is entirely disconnected from the line and the current is not shunted through the lamp. The line wire enters this switch box, being properly looped, and the terminals from the switch to the lamps project through the bottom of the switch base in the form of two heavy, insulated brass hooks.

On top of the lamp-hood are two corresponding hooks, and to connect the lamp to the terminals from the line projecting through the switch base it is simply necessary to engage the hooks on the lamp with those from the bottom of the switch box. This is done by a rotary movement, and to facilitate this operation, and also to prevent any swinging of the lamp and to hold the hooks firmly together, a centrally placed pin from the top of the lamp-hood enters an aperture in a projected stud from the switch-box base. This pin serves both as a pivot and a steadying pin or bolt. Many advantages are claimed for this "hanger cut-out," as it is called to distinguish it from the ordinary cut-out boards.

The company also makes an open-air series lamp similar to the foregoing. The power and railway circuit lamps employ the differentially controlled mechanism as in the series constant-current lamps. They burn two in series on 220 volts, and five in series on 500 volts, taking four and one-half to five amperes. Resistance is provided on top of each lamp, or one resistance in a fireproof box for the entire group. A distinctive feature of the lamp is that all parts of the mechanism are either enameled, nickeled or japanned.

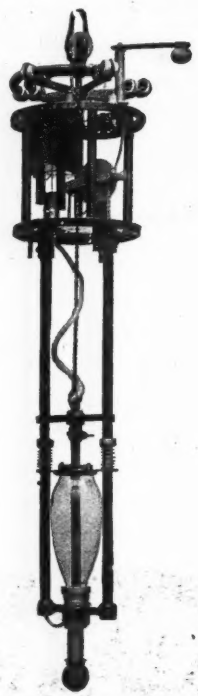


FIG. 1.—STERLING DIRECT-CURRENT, CONSTANT POTENTIAL ARC LAMP.

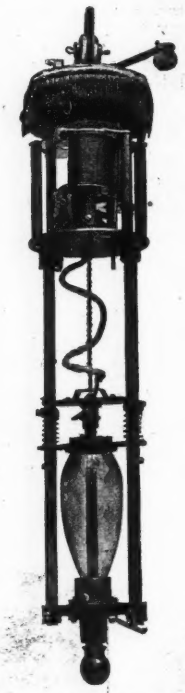


FIG. 2.—STERLING ALTERNATING, ENCLOSED ARC LAMP.

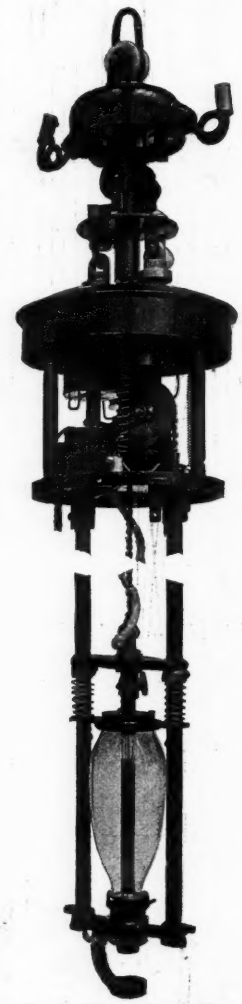


FIG. 3.—STERLING CONSTANT-CURRENT, SERIES ARC LAMP.

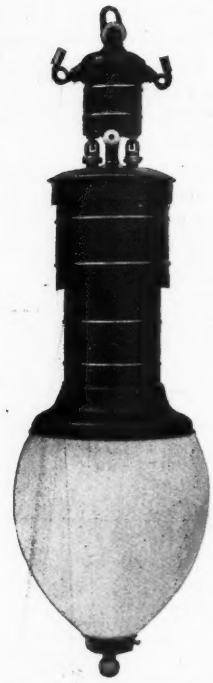


FIG. 4.—STERLING ARC LAMP, STYLE "D."

The Commercial Cable Company announced last week that the cable between Hong Kong and Manila had been repaired.

Deputy Commissioner Walton, of the Department of Public Buildings, Lighting and Supplies, has declined to issue a permit to the Brooklyn Heights Railroad Company for an overhead trolley line on Montague street, Brooklyn, N. Y., as a substitute for the cable. Mr. Walton says that the necessary consent of the State Railroad Commission had not been secured, and besides he is opposed to overhead trolley wires. He is willing to issue a permit for an underground road.

HYDRAULIC ILLUSTRATION OF THE WHEATSTONE BRIDGE.

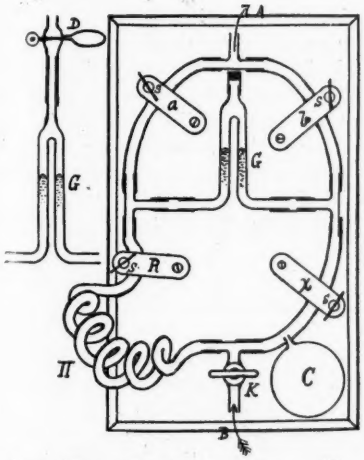
BY WILLIAM HALLOCK IN "SCIENCE."

Although it is undesirable to push the analogy between the electric current and the flow of water too far, or to get the idea of an actual current too firmly established in the student's mind, still a hydraulic illustration is often useful to point out how the results may follow.

To show the action of the Wheatstone bridge by flowing water is usually complicated by the effects of gravity, and illustrates the conditions of pressure rather than those of resistance to flow. Moreover, the question of the galvanometer is a troublesome one, inasmuch as most devices require such a flow of water as to interfere with the bridge effects which it is desired to bring out.

The arrangement described below has proved quite satisfactory in showing the simpler resistance effects in the bridge, but especially useful in making clear the effects of capacity and self-induction, and how the two may be balanced and compared.

The accompanying sketch is taken from a simple home-made bridge which was constructed as an experiment. Upon a board about 30 by 50 by 4 centimetres are fastened four



glass T's of about five millimetres inside diameter. Two of these T's have their side projections turned inward and are connected, by short pieces of rubber tubing, to the "galvanometer" G. The other two T's have their side projections turned outward, and these connect by long pieces of tubing with two large aspirator bottles, not shown; *a*, *b*, R and *x* are brass strips held under a screw at the inside end and resting over rubber tubes which can be compressed and closed by the screws *ssss*. These screws are made by soldering a piece of brass about 15 by 25 by 1 millimetre, with corners rounded, into the slot of a common wood screw.

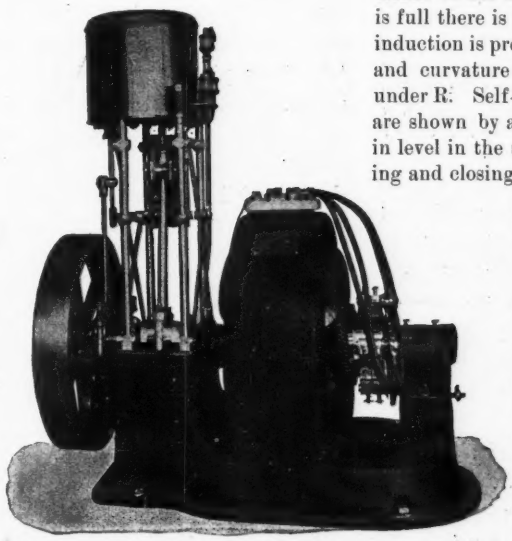


FIG. 1.—RUSHMORE MULTI-VOLTAGE GENERATOR SET.

Under R is a piece of tubing several feet long when self-induction is to be shown; otherwise a short piece is used, like those under *a*, *b* and *x*, just long enough to connect the corresponding T's. C is a pint aspirator bottle, with its small side tubulure inserted into the side of the rubber tube. The "galvanometer" is a T of peculiar form, as shown, closed at its top by a rubber tube and plug or pinch-cock, as shown at D. It is really an electrometer, as it shows difference of pressure (potential) instead of current. In operation the board lies horizontal on a table and the tube G is stood up perpendicular so that it becomes a manometer. To start the apparatus fill the large bottle connected with B and set it higher than the board, tilt the A end of the board up 10 or 15 degrees, place the A bottle lower than the B one and open the stop-cock (key) K. The water will flow through the tubes, driving out the air, and a little manipulation of D will bring the water in the manometer to a convenient point. The board is then to be placed horizontal again. By compressing *a* and *b* about equally resistance to flow is introduced into these two arms of the bridge; then compressing *x* will require a corresponding compression of R in order to balance the pressure in G. It will be readily seen that the qualitative effects can be thus shown, but for quantitative relations it would be necessary to replace the crude compressors by graduated stop-cocks. The capacity can be regulated by closing K, raising the A bottle and taking the cork out of C, allowing it to fill more or less, and then replacing the cork; the "capacity" is proportional to the air left in C. When C is full there is no capacity in *x*. Self-induction is proportional to the length and curvature of the long tube, H, under R. Self-induction and capacity are shown by a momentary difference in level in the manometer upon opening and closing K, the throw (balistic galvanometer) being in the opposite direction on closing K to that upon opening K. Changing the levels of the A and B bottles will show that the results are independent of the direction or value of the pressure (electro-motive force). The manometer (galvanometer) may be made more and more delicate by turning it down more and more nearly horizontal, and by projecting the image of G upon a screen its operation may be shown to a large class.

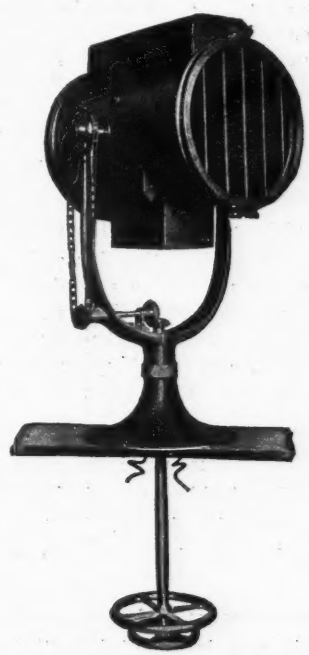


FIG. 3.—IMPROVED RUSHMORE PILOT HOUSE PROJECTOR.

Individual ingenuity will devise many variations and improvements in details and experiments; the fancied merits of the apparatus lie in the galvanometer device and in the elimination of the effects of gravity pressure in the bridge itself, as well, perhaps, as in the self-induction and capacity elements.

Some New Rushmore Apparatus.

The illustrations herewith show some of the latest type apparatus brought out by the Rushmore Dynamo Works, of Jersey City, N. J., who make a specialty of marine lighting equipment and multi-voltage dynamos.

Fig. 1 shows a multi-voltage generating set designed by Mr. Rushmore for yacht-lighting plants in connection with storage batteries. The dynamo works on the new multi-voltage system so that it will charge

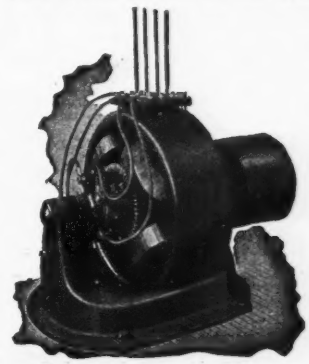


FIG. 2.—BELT DRIVING MACHINE.

the cells without additional apparatus. At full load the machine works in parallel with the battery and at light load the lights are carried on one pair of brushes at 110 volts, and the battery is connected to the other pair, and the voltage raised to 160 volts or over for charging. This does away with boosters and resistances and enables the machine to charge the cells during the night run, whereas in other plants it is customary to run all day.

The engine is designed after the latest torpedo-boat practice. All parts are of forged steel finished all over. The governor is of the Rites inertia pattern and controls the speed within one-fourth of one per cent. The machine runs at 500 revolutions per minute without the least noise.

Fig. 2 shows the multi-voltage machine for belt driving. These machines are coming into extensive use in all classes of service where current is required at different and variable voltages, as in storage battery, feeder and main and elevator systems, electroplating, etc. The Rushmore company is now applying the system at the great electrolytic copper refining works of the Nichols Chemical Company. In this plant there are 10 direct-connected machines aggregating 1,500 horse-power and there will be added two additional units of 400 horse-power each. Each dynamo delivers current to a number of circuits taking 100 amperes each, and as the resistance of the tanks varies, the voltage must vary from 100 to 200 volts. To get the same regulation on the old system, 40 boosters would be required.

Fig. 3 shows the latest type Rushmore pilot-house projector. This light is now in extensive use on yachts and merchant steamers and in the last 60 days the Rushmore company has shipped nearly 100 of the 18-inch size alone.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]
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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue. NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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When you go to Boston to attend the convention of the American Street Railway Association, which meets September 6 to 9, don't forget to take along your light overcoat. Those famous "east winds" are treacherous and full of ills for the unsophisticated.

It is too unfortunate that the war came to an end before that long-range electric gun could be built and mounted at Key West to knock Havana into smithereens!

An Eastport man is contemplating the purchase of the plant of the Electrolytic Marine Salts Company, at North Lubec, for use as a sardine factory.—*Press dispatch.*

That's all right, too, and the first sardine the stockholders would like to see canned is the one that got away with their money. But the Jernegan brand of sardines is elusive, wary and hard to catch.

Next thing we hear of will be a shot-proof steel "dummy," with automatically controlled arms for wig-wagging from ship to ship. The dummy will also be supported on a spring base, so that even if a shot come aboard and knock him over he will get upon his feet at once and resume the interrupted wig-wagging. In these days of electric wonders there should be little difficulty about such a trifle as an electric wig-wag man.

It is undoubtedly true that the searchlight was an invaluable adjunct to the equipment of the blockading fleet at Santiago, and was the real cause of Cervera's failure to attempt a night sortie. But the apparatus needs to be strengthened or cushioned in some way. The searchlights of the "Texas" were rendered useless, at least temporarily, by the tremendous concussion of the big guns in the battle. Of course, the makers will overcome this defect.

The immense estate left by the late Jay Gould will soon be divided in accordance with his will. Next month Frank J. Gould, the youngest child, comes of age and the Gould millions must be apportioned among the heirs. This means in all probability that the control of the Manhattan Railway Company will pass into other hands, and it is rumored that the Metropolitan Street Railway Company, of New York city, may acquire this valuable property. If such should prove to be the case, it is hoped that dalliance with fate will cease and that electric power will be installed at once on the elevated railway system of New York city.

One result seems to be assured by the experience of the war. Electric and contact submarine mines will not stand prolonged submersion. In several instances contact mines became so coated with barnacles that the firing pins were rendered inoperative. In other cases the electric firing cables became so fouled from various causes that it is doubtful if they would have proved reliable in emergency. So far as known, however, the electric system seems to have the best of it. But, in any case, such devices should be constructed and located with a view to frequent testing and inspection, which should be rigidly enforced.

We print this week an interesting and profusely illustrated article about the system of the Cleveland Telephone Company, at Cleveland, Ohio. Improvements have recently been made in this company's plant which bring it up to date, and place it in advance of any other telephone system. The ELECTRICAL REVIEW has the assurances of eminent telephone engineers that the present equipment of the Cleveland Telephone Company is the finest and most perfect of any in the world. As such, it is a model for others to observe and follow. Many of the improvements there installed, we understand, will soon be adopted by the New York Telephone Company.

The Third Avenue Railroad Company, of New York city, which will abandon the cable for electric motive power, will soon place contracts for the necessary apparatus. It is understood that the road will be operated on the three phase system, and that only the three largest manufacturing companies have been asked to bid on the power station equipment. An immense amount of feeder cable will be required, about $1,500,000 worth in all. It is believed that the cable contract will be divided into several parts, and that all the well known cable makers will be asked to bid. The plans for the installation of the underground system are practically completed. Whoever is lucky enough to share in these large orders will have a nice nest egg to start the season's business with.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FIFTIETH ANNIVERSARY MEETING IN BOSTON LAST WEEK.

The fiftieth anniversary meeting of the American Association for the Advancement of Science held its opening session at Boston on Monday, August 22. The proceedings were reported in the ELECTRICAL REVIEW for August 24.

No general session was held by the association on Monday afternoon, but the nine different sections met and papers were presented by the vice-president of each section, which bore directly upon the work of the respective sections. One of the most interesting papers was that by Professor Smith on "The Electric Current in Organic Chemistry." In this paper Professor Smith outlined the growth of this branch of electricity and said that it had been a stepping stone to great advances in other branches of electrical science. The use of the current in electrolytic solutions had in many cases led to a complete reversal of many previous ideas as to the composition of important solutions, and had been of immense advantage to the industrial side of the question.

Professor Richards presented a thesis, copiously illustrated with the stereopticon, upon "Ore Dressing" before the section in mechanical science, dealing with some of the newly devised methods for preparing quartz, blende and galena ores for manufacture. Perhaps the most studied address of the day was delivered by the retiring president, Wolcott Gibbs, of Rhode Island, entitled "On Some Points in Theoretical Chemistry." Following this address there was a reception to the members and guests of the association.

The chairman of the local committee announced that the social part of the programme had been much enlarged and included excursions to various points of interest about the city. He said that it was the intention of the committee to make Wednesday and Friday gala days, and that arrangements had been perfected for the continuous entertainment of the members of the association.

Thursday was a day of serious work for the members of the association. Each of the sections held two meetings devoted to the presentation of papers on special scientific subjects. It was soon found that all of the papers could not be read before the association, owing to lack of time.

The most important announcement of the day was that of Mr. Charles F. Brush, who gave in detail the process of discovery of a new gas in the atmosphere which he at present terms etherion.

The afternoon excursion about Boston Harbor was perhaps the most largely attended excursion of the day. About 400 of the scientists thoroughly enjoyed the trip and the sight of its historic points of interest.

In the evening from 9 until 11 the public library was open to the members. Mayor Quincy gave a dinner at the Union Club to the officers and guests of the association. Thirty-six guests were present, and the occasion was enjoyed by all. Among the foreign guests were Professor Charney, delegate of the French Government; Professor Cooke and Professor Howard, of London; Professor Galbraith, of Toronto, and M. Paul du Chaillu, the African explorer. Mayor Quincy presided, and several short speeches were made by some of those present.

Wednesday was Salem day. Several excursions were made to this historic point, and as a consequence very little work was done at the headquarters of the association. The first party started at 7.45 in the morning, and was composed of engineers and sanitarians, and went to the Metropolitan waterworks at Clinton. Officers of the water company explained the workings of this complete water system and the reservoir, which is the largest in the country.

A party of 80 went to Lawrence, where several big print works were visited.

The chief event of the day, the Salem excursion, left early for that place. The sail down the bay affords a fine view of the harbor and islands.

A landing was made at Salem Willows, where the visitors became the guests of the Essex Institute, of Salem. Here the local committee served the scientists with an old-fashioned New England shore dinner. The party then divided into groups, and, under the guidance of the local committee, the scientists were shown the historic points of interest about the place.

Interesting sessions were held Thursday, Friday and Saturday, Friday being known as Cambridge day, the association visiting Harvard University.

On Thursday Prof. Edward Orton was elected president for the ensuing year and Columbus, Ohio, selected as the place for the convention in 1899. Professor Orton is state geologist of Ohio, a graduate of Harvard.

STREET RAILWAY CONVENTION

Boston the Mecca of the American Association Next Week.

A LIST OF THE EXHIBITORS AND THE PROGRAMME IN FULL—ELABORATE PROVISIONS FOR THE SEVENTEENTH MEETING — EXCELLENT WORK BY LOCAL COMMITTEES — LARGE ATTENDANCE ASSURED—BEGINS AT 10 A. M. TUESDAY, SEPTEMBER 6, AND CONTINUES FOUR DAYS.

The regular annual convention of the American Street Railway Association will be held in the city of Boston next week, beginning at 10 A. M. on Tuesday and continuing four days. A very extensive exhibit is to be made of electrical and other apparatus for street-car use in the Mechanics' Building, two floors being occupied. The committee on exhibits, Mr. Charles S. Clark, chairman, have been unremitting in their labors, and a fine and comprehensive show of apparatus is assured.

The officers of the association are the following named gentlemen:

President—A. E. Lang, Toledo.

Vice-presidents—W. Caryl Ely, Niagara Falls; John A. Rigg, Reading, Pa.; E. G. Connette, Nashville.

Secretary and Treasurer—T. C. Penington, Chicago.

Through the efforts of Secretary Penington an excellent programme of papers and discussions has been arranged, and a very interesting and instructive meeting is to be expected. Boston will present a hospitable welcome to these couriers of transportation, and before the visitors leave full opportunity to visit the many historic points of interest will be extended.

The list of exhibitors and programme in full follow:

The Daily Programme—September 6 to 9, Inclusive.

TUESDAY.

10 A. M. Meeting called to order by Albion E. Lang, president.
Calling of the roll.
Invitation extended to join the association.
Address of the president.
Report of the executive committee.
Report of the secretary and treasurer.
Reading of paper on "Comparative Earnings and Economy of Operation Between Single and Double Truck Cars for City Use," Richard McCulloch, electrical engineer, Cass Avenue and Citizens' Street Railway Companies, St. Louis, Mo.
Reading of paper on "Municipal Ownership of Street Railways."
Afternoon—Trip to Concord and Lexington.
Evening—Reception at hall.
The exact hour of starting on the different trips will be announced each day in the convention.

WEDNESDAY.

Convene at 9.30 A. M.
Reading of paper on "Maintenance and Equipment of Electric Cars for Street Railways," M. S. Hopkins, electrician, Columbus Street Railway Company, Columbus, Ohio.
Reading of paper on "Carrying of United States Mail Matter on Street Railways," W. S. Dimmock, general superintendent, Omaha & Council Bluffs Railway and Bridge Company, Council Bluffs, Iowa.
Appointment of committee on nomination of officers and selection of next place of meeting.
Morning—Ladies to be taken to points of local and historic interest.
Afternoon—Excursion down the harbor. Clambake at Nantasket Beach.

THURSDAY.

Convene at 9.30 A. M.
Reading of paper on "To What Extent Should Street Railway Companies Engage in the Amusement Business," Walton H. Holmes, general manager, Metropolitan Street Railway Company, Kansas City, Mo.
Reading of paper on "Inspection and Testing of Motors and Car Equipments by Street-Railway Companies," Frederick D. Perkins, electrical engineer, Toledo Traction Company, Toledo, Ohio.
Election of officers.
Morning—Drive through the park for the ladies.
Afternoon—Trip to Plymouth. Annual dinner, Hotel Brunswick, 7 P. M.

FRIDAY.

Convene at 9.30 A. M.
Reading of paper on "Cost of Electric Power for Street Railways at Switchboard, Both Steam and Water," R. W. Conant, electrical engineer, Boston Elevated Railroad Company, Boston, Mass.
Report of committee on standing rules for government of conductors and motormen.
Unfinished business.
Installation of officers.
Adjournment.
Morning—Shopping trip for the ladies, visiting principal stores.
Afternoon—Trolley excursion to Norumbega Park.

Exhibitors.

Messrs. McCardwell, West & Co., Trenton, N. J.
Rochester Car Wheel Works, 556 West Thirty-fourth street, New York.
New York Car Wheel Works, Buffalo, N. Y.
Taunton Locomotive Manufacturing Company, Taunton, Mass.
Peckham Motor Truck and Wheel Co., 53 State street, Boston.
Barney & Smith Car Co., Dayton, Ohio.
Briggs Carriage Co., Amesbury, Mass.
James L. Kimball, 1102 Exchange Building, Boston.
Graham Equipment Co., 521 Exchange Building, Boston.
Bemis Car Box Co., Springfield, Mass.
McGuire Manufacturing Co., 122 North Sangamon street, Chicago.
J. G. Brill Co., Philadelphia, Pa.
Walker Company, Cleveland, Ohio.
Taylor Electric Truck Co., Troy, N. Y.
Pennsylvania Car Wheel Co., Pittsburgh, Pa.
Hampden Corundum Wheel Co., Brightwood, Mass.
Springfield Manufacturing Co., Bridgeport, Ct.
Robinson Electric Truck and Supply Co., Devonshire Building, Boston.
Baltimore Car Wheel Co., Fulton Junction, Baltimore, Md.
The Johnson Co., 53 State street, and Lorain, Ohio.
Massachusetts Mohair Plush Co., 65 Franklin street, Boston.
Sampson Cordage Works, 115 Congress street, Boston.
Frank W. Morse, 116 Bedford street, Boston.
Ohio Brass Co., Mansfield, Ohio.
New Haven Car Register Co., 218 George street, New Haven, Ct.
Corning Brake Shoe Co., 35 Nassau street, New York.
Ashton Valve Co., 271 Franklin street, Boston.
Ham Sand Box Co., 378 River street, Troy, N. Y.
Wadsworth, Howland & Co., 34 Washington street, Boston.
American Mason Safety Tread Co., 40 Water street, Boston.
Wheel Truing Brake Shoe Co., 11 East Atwater street, Detroit, Mich.
Creaghead Engineering Co., Cincinnati, Ohio.
A. O. Norton, 167 Oliver street, Boston.
Forsyth Brothers Co., 11 South Jefferson street, Chicago, Ill.
American Railway Supply Co., 24 Park place, New York.
Adam Cook's Sons, 313 West street, New York.
Pantasote Co., Columbia Building, 29 Broadway, New York.
Thayer & Co., incorporated, Tremont Building, Boston, Mass.
Albert and J. M. Anderson Manufacturing Co., 289 A street, South Boston, Mass.
H. W. Johns Manufacturing Co., 170 William street, New York.
Westinghouse Electric and Manufacturing Co., 53 State street, Boston.
ELECTRICAL REVIEW, 41 Park row, New York.
Bureau of Information, 101 Milk street, Boston.
Harold P. Brown, 120 Liberty street, New York.
F. H. Newcomb, 136 Flatbush avenue, Brooklyn, N. Y.
W. F. Van Dorn Co., Chicago, Ill.
Falk Manufacturing Co., Milwaukee, Wis.
Frederick C. McLewee, 220 Broadway, New York city.
Beverly Machine Works, Beverly, Mass.
Boardman Tucker Company, 97 Oliver street, Boston.
Stanley & Miles, Whitman, Mass.
J. T. McRoy, Chamber of Commerce, Chicago, Ill.
Standard Underground Cable Co., 18 Cortlandt street, New York.
Pierson Jack Co., 64 Federal street, Boston.
The Wagner Electric Manufacturing Co., 620 Atlantic avenue, Boston.
E. F. Dewitte & Co., Lansingburgh, N. Y.
Knitted Mattress Co., Canton Junction, Mass.
Street Railway Review, 890 Old Colony Building, Chicago, Ill.
Street Railway Journal, 26 Cortlandt street, New York.
Railway World, Illustrated, Amberly House, Norfolk street, London, W. C.
Ornamite Veneer Co., 1203 Havemeyer Building, New York.
Pennsylvania Steel Co., 70 Kilby street, Boston, Mass.
Weber Railway Joint Manufacturing Co., Cotton Exchange Building, New York.
The Adams Westlake Co., 110 Ontario street, Chicago.
Bibber-White Co., 49 Federal street, Boston.
C. F. Orr & Co., Chicago, Ill.
William F. Ellis, 178 Devonshire street, Boston.
Pettingell Andrews & Co., 5 Winthrop square, Boston.
General Electric Co., 180 Summer street, Boston.
The Consolidated Car Fender Co., Providence, R. I.
Christensen Engineering Co., Milwaukee, Wis.
Barbour, Stockwell Co., Cambridgeport, Mass.
The Billings & Spencer Co., Hartford, Ct.
Sherburne & Co., 53 Oliver street, Boston, Mass.
Wm. Wharton, Jr., & Co., Incorporated, Station D, Philadelphia, Pa.
Hipwood-Barrett Fender Co., 53 State street, Boston, Mass.
Shawmut Fuse Wire Co., 93 Federal street, Boston, Mass.
The Cleveland Frog and Crossing Co., Bessemer avenue and Erie Railroad, Cleveland.
Cambria Iron Co., 33 Wall street, New York.
American Rail Joint and Manufacturing Co., 219 Superior street, Cleveland, Ohio.
Van Wagnoner & Williams Hardware Co., Cleveland, Ohio.
International Register Co., 135 South Clinton street, Chicago.
Frank Ridlon Co., Boston.
R. D. Nuttall Co., 179 Grant avenue, Allegheny, Pa.
John Stephenson Co., Limited, 47 East Twenty-seventh street, New York.
Consolidated Car Heating Co., 413 North Pearl street, Albany, N. Y.
Heyward Bros. & Wakefield Co., 174 Portland street, Boston.
Boston Artificial Leather Co., 133 Pearl street, Boston.
Burdett & Johnson, 19 Pearl street, Boston.
Joseph Dixon Crucible Co., 68 Reade street, New York, N. Y.
Crosby Steam Gauge and Valve Co., 93 Oliver street Boston, Mass.
R. Woodman Manufacturing and Supply Co., 63 Oliver street, Boston, Mass.
The Columbia Machine Works, 18 Fulton street, Brooklyn
Chas. Scott Spring Co., 1038 Mascher street, Philadelphia, Pa.
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The E. T. Burrowes Co., Portland, Me.
Elmer Morris, 15 Cortlandt street, New York.
Meaker Manufacturing Co., North Chicago, Ill.
The Johnson Co., Lorain, Ohio.
Sterling Supply and Manufacturing Co., 141 East Twenty-fifth street, New York.
William Truss Rail Joint, 61 Traders' Building, Chicago, Ill.
J. D. Reed, 82 Maywood street, Roxbury, Boston, Mass.
John F. Ohmer, Dayton, Ohio.
J. A. Lakin & Co., Westfield, Mass.
Rooke Register Co., Peoria, Ill.

Convention of Edison Illuminating Companies.

The annual convention of the Association of Edison Illuminating Companies is to be held at Sault Ste. Marie, Mich., September 12, 13 and 14, inclusive. The meetings of this association are confined exclusively to the members, but there is generally a large attendance of allied interests.

Mr. Samuel Insull, of Chicago, is president of the association, and Mr. Wilson Howell, of Harrison, N. J., is secretary.

ETHERION.

A NEW GAS IN THE ATMOSPHERE DISCOVERED BY CHAS. F. BRUSH.

The feature of the fiftieth meeting of the American Association for the Advancement of Science, held at Boston last week, was the presentation of a preliminary paper on "A New Gas," by Mr. Charles F. Brush, the well known electrical inventor and scientist.

The gas is a constituent of the atmosphere, and is found absorbed in many substances. Its chief characteristic thus far experimentally determined is enormous heat conductivity at low pressure. Mr. Brush showed that its conductivity, even when mixed with a large access of other gases, is something like a hundred times that of hydrogen, the best gaseous conductor heretofore known; and conjectures that the conductivity of the pure gas will be found a thousand or more times that of hydrogen.

Mr. Brush referred to a prefactory paper on heat transmission by gases, read by him at last year's meeting of the association, and embodied some of its material in a curve chart showing the heat conductivity of several known gases at only a few millionths of atmospheric pressure, and also that of the new gas in several degrees of impurity. Mr. Brush discovered the new gas nearly a year and one-half ago, while looking for occluded hydrogen in glass. He found not only hydrogen, but something of vastly greater importance.

After many months of experiment he has recently effected partial separation of the new gas from the air by diffusion. In a first diffusion the heat conductivity of air was increased something like a hundred-fold. Mr. Brush expects to obtain the gas in a state of approximate purity by successive diffusions of air.

A table of figures was exhibited, showing the molecular weight, density, specific heat, relative mean molecular velocity and heat conductivity of the gases whose heat conducting curves appeared in the chart; and attention was directed to the evident close relationship between the heat conductivity and molecular velocity of the gases.

From this relationship some other properties of the new gas were deduced. Taking the heat conductivity of the new gas at a hundred times that of hydrogen, a very conservative estimate, its mean molecular velocity at freezing temperature was calculated to be more than a hundred miles per second, and its density only a thousandth part that of hydrogen; while the specific heat was found to be 6,000 times greater than that of hydrogen, the substance having the greatest specific heat heretofore known. These figures were adduced simply to show the order of magnitude that may be established by further investigation.

It was shown that a gas having attributes anything like those cited could not possibly be confined to the earth's atmosphere, and hence the new gas, being found here, probably extends indefinitely into space and constitutes an inter-stellar atmosphere. In recognition of this probability, Mr. Brush has named the new gas etherion, meaning "high in the heavens." Some evidence was cited tending to show that etherion is a mixture of at least two different gases, and Mr. Brush hazarded the conjecture that on further investigation three or more gases will be found, forming one or more periodic groups of new elements all very much lighter than hydrogen. The possibility that etherion may be found to be identical with the so-called ether was touched upon, and Mr. Brush expressed the hope that it would be found to account for at least some of the phenomena heretofore attributed to the ether.

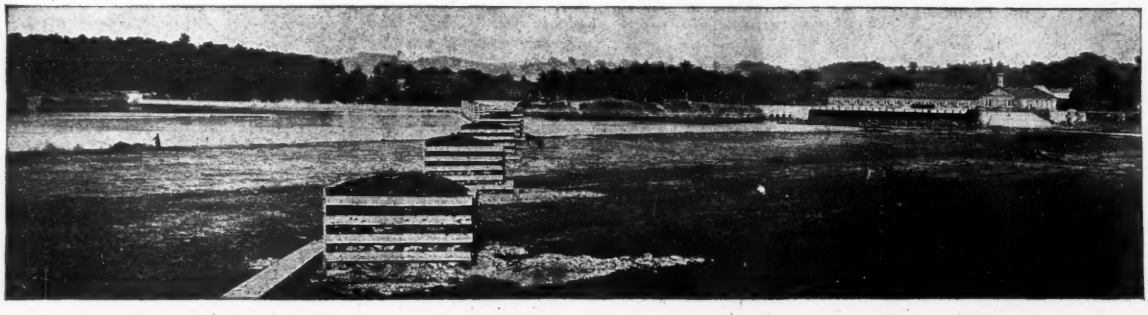

FIG. 1.—"THE MECHANICVILLE, N. Y., TRANSMISSION PLANT"—DEVELOPMENT OF THE WATER-POWER.

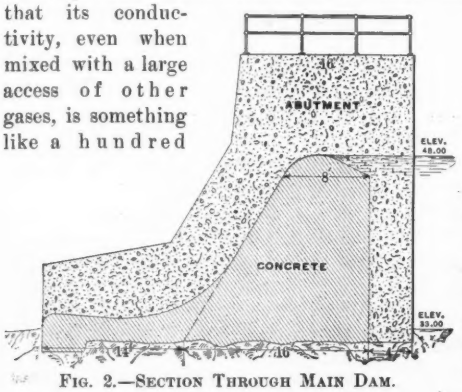

FIG. 2.—SECTION THROUGH MAIN DAM.

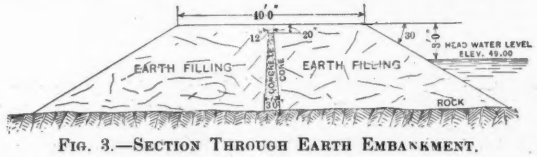

FIG. 3.—SECTION THROUGH EARTH EMBANKMENT.

The contract for the building of the water-power canal in the Michigan Sault has been let, and the work of construction will begin early next month. About $2,000,000 will be expended.

THE MECHANICVILLE TRANSMISSION PLANT.

DESCRIPTION OF A HUDSON RIVER WATER-POWER WHICH WILL SUPPLY CURRENT TO SCHENECTADY AND OTHER NEARBY PLACES.

Early in 1897 the attention of Mr. R. N. King, president of the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, was drawn to the power of the upper waters of the Hudson River at Mechanicville, N. Y., where 5,000 to 7,000 horse-power is available. He recognized the possibilities which here lay ready to hand. The site is only two miles from Mechanicville, 11 miles from Troy and 18 miles from Albany, in each of which towns large quantities of power would, without doubt, find a market. It lay only 17 miles from Schenectady, where, covering 130 acres of ground, the works of the General Electric Company are operated from an extensive steam plant, with which the electrical power from the Mechanicville cataract could readily compete. After consultation with the chief engineers of the General Electric Company, in which the necessary assurances were given, Mr. King formed the Hudson River Power Transmission Company.

The hydraulic engineering features of the development were carried out in their entirety by Mr. A. C. Rice. As the General Electric Company was to purchase the largest amount of power, its advice as to the electrical equipment was naturally closely followed. At the point chosen for the hydraulic development the banks and bottom of the river are of rock. Bluff Island divides the Hudson into two channels, and here, during the greater part of the year, is water sufficient to produce from 7,000 to 10,000 horse-power. The island is about one-third of the distance across the river from the western bank, the combined width of the two channels being about 1,200 feet. The western channel is used for the head and tail-races.

The power-house extends out into

FIG. 4.—UP-STREAM SIDE OF POWER-HOUSE WITH FOREBAY.

the river about 215 feet and is connected with Bluff Island by a concrete dam 26 feet high, 10 feet wide on top and 18 feet wide at the base. The dam is provided with four arched waste gates four feet wide and six feet nine inches high, operated in the same manner as those in the main dam on the eastern side of the island The main dam is 16 feet high, eight feet thick immediately below the crest, 16 feet thick through the base and 30 feet thick through base and apron. It is set between massive abutments anchored to the rock sides of the river bank and island. The length of the spillway between abutments is 800 feet. In the western abutment are 12 arched waste gates, each four feet wide and six feet high and opened and closed by a heavy iron hoist operated by rack and pinion. The eastern dam is practically a solid rock.

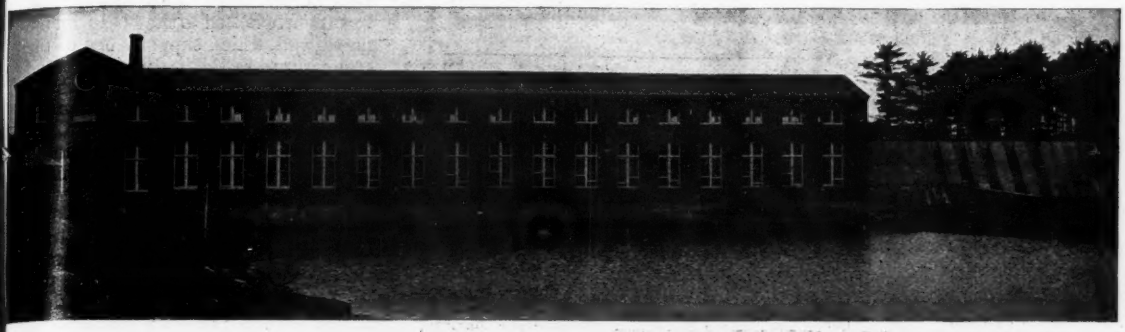

FIG. 5.—DOWN-STREAM SIDE OF POWER HOUSE AND TAIL RACE.

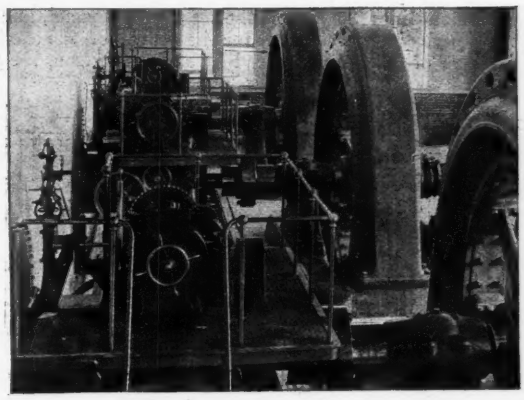

FIG. 6.—MAIN-WHEEL GOVERNORS—GIESLER TYPE.

FIG. 7.—A MAIN-WHEEL CHAMBER.

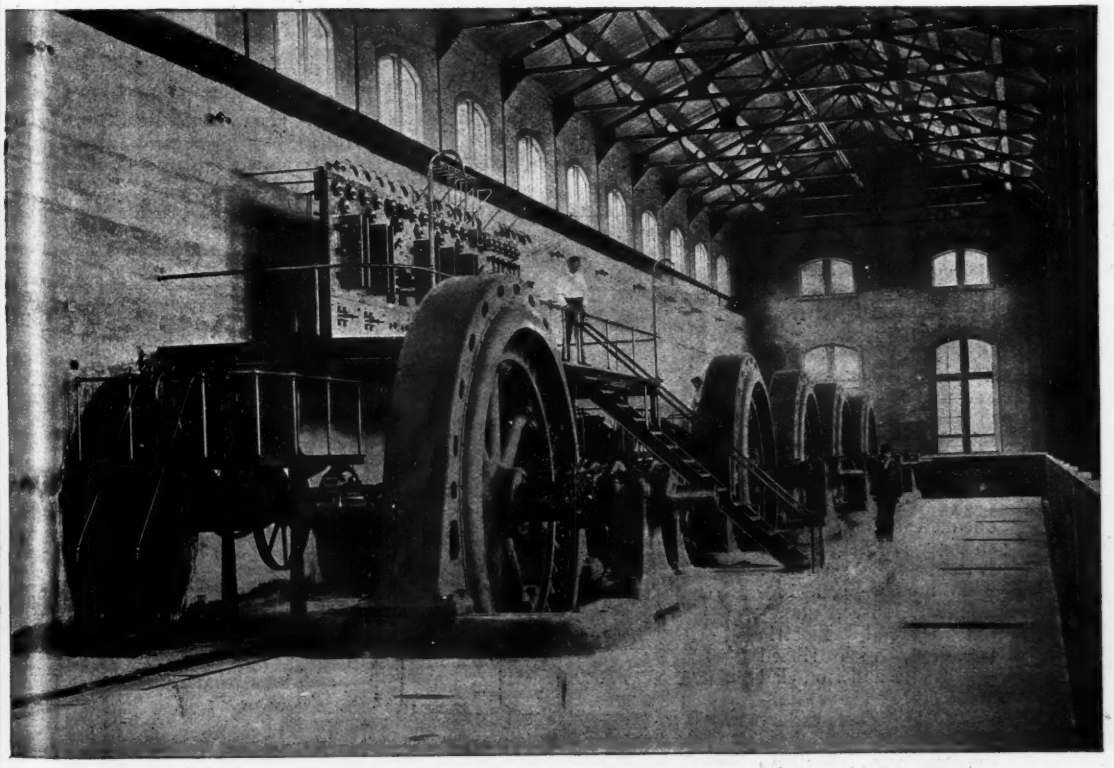

FIG. 8.—INTERIOR OF POWER-HOUSE—DYNAMO-ROOM.

The power-house lies between the west bank and the short concrete dam, nearly filling the space between the island and the west bank of the river. It is practically a continuation of the dam, and like the main dam is of concrete, with the exception of the upper walls. Its construction is of the most substantial character. The walls form a separate and distinct tail-race 22 feet wide for each set of turbines, from which the water may be shut out at will. The house is divided into two parts, the up-stream part containing wheel chambers for seven 1,000-horse-power wheels, of which five only are at present occupied. The down-stream portion contains the wheel governors and the electrical apparatus. The length of the power-house proper is 257 feet 6 inches; the width of the dynamo-room between head wall and south wall 34 feet, and the width of the wheel chamber portion 32 feet 6 inches. The total width of the power-house is 66 feet 6 inches. At the western end an L extension runs up stream 87 feet 5 inches long and 44 feet 10 inches wide. The western stream running between the bank and the island forms the forebay, 300 feet long. The main tail-race is 205 feet wide and joins the main stream 750 feet below the power-house. Arched chambers are provided for seven main wheels and two exciter wheels. In the head wall of each main chamber is set a heavy cast-iron cover through which the turbine shaft passes in a watertight packing box, carrying the ring oil bearing for the shaft. The saving in space effected by the new arrangement of housing and coupling together of the turbines has tended to diminish considerably the size of the power house.

The main wheel plant consists of 10 pair of 42-inch horizontal Victor turbines of the latest type, built by the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio. Each consists of two pairs of wheels which, at the normal speed of 114 revolutions, are rated at 250 horse-power. The total power of each set of turbines is therefore 1,000 horse-power. Five units are now in position. The head under which the water-wheels are operated is 18 feet. The turbines for the exciters consist of three 18-inch Victor cylinder gate wheels having, at 259 revolutions per minute, a total of 300 horse-power. The quarter turns and packing boxes of these wheels are brought through the wall beneath the station switchboard. Two draft tubes lead from each main turbine. Two draft tubes are also allotted to each set of exciter wheels.

The speed of each set of main wheels is regulated by a Geisler electro-mechanical governor. The governors controlling the exciter-wheel gates are improved Snow governors.

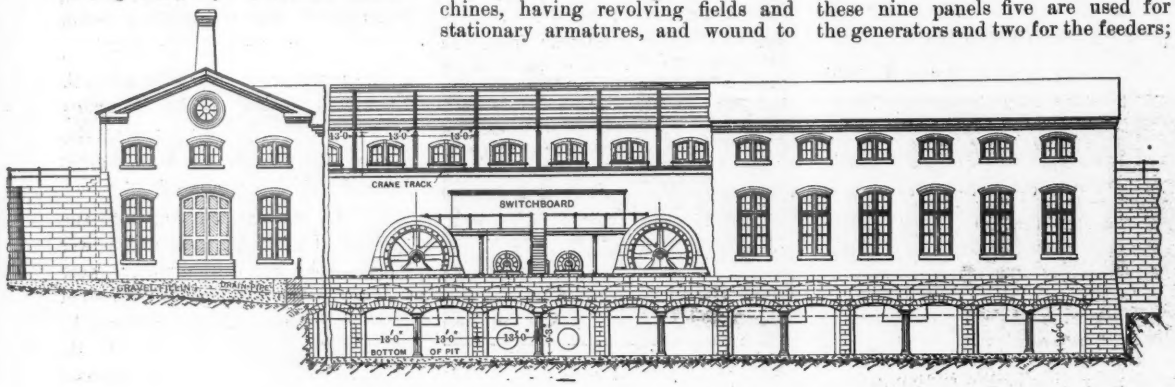

FIG. 9.—SIDE ELEVATION OF POWER-HOUSE LOOKING UP-STREAM.

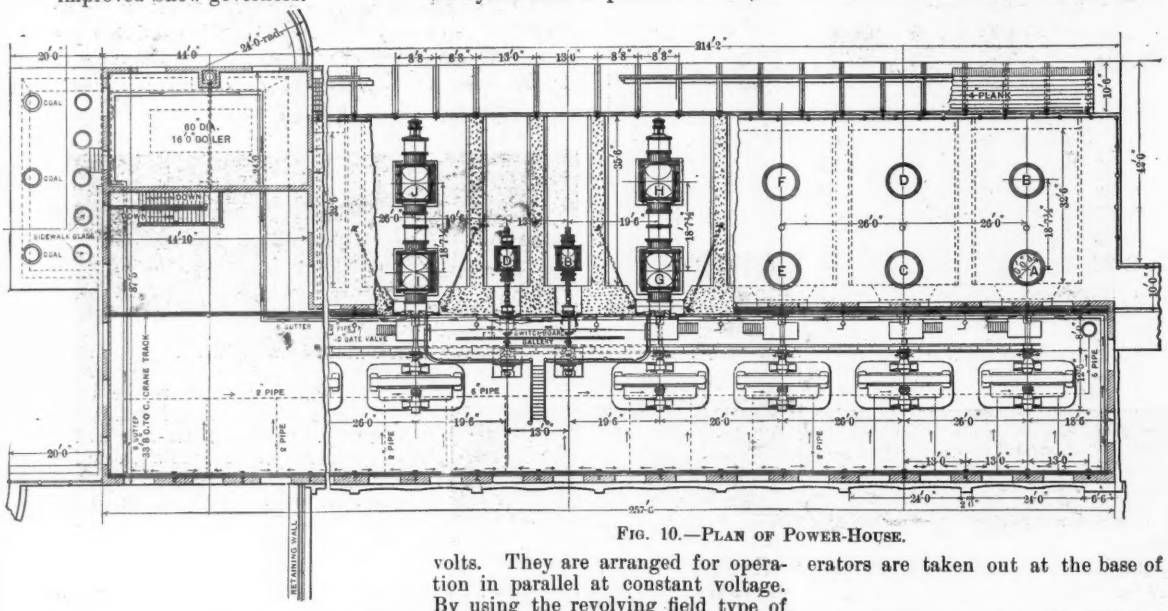

FIG. 10.—PLAN OF POWER-HOUSE.

The dynamo-room is 255 feet long and 34 feet wide, 30 feet 5 inches in the clear from floor to roof truss and 22 feet from floor to crane. The ultimate generator capacity of the station is 7,000 horse-power, in seven generators each of 750 capacity. Five have been installed and are now running. They are unitooth, three-phase, 40-pole, 750-kilowatt, 114-revolution, alternating-current machines, having revolving fields and stationary armatures, and wound to deliver to the transmission lines 36 amperes of current at a periodicity of 38 cycles and a pressure of 12,000 volts. They are arranged for operation in parallel at constant voltage. By using the revolving field type of generator, and thus securing this pressure directly from the machine, the use of step-up transformers to raise the voltage for transmission purposes is avoided. As the current is to operate synchronous and induction motors, to operate lights and to be converted into direct current through rotary converters, a frequency of about 40 cycles was selected as most suitable for the different conditions required.

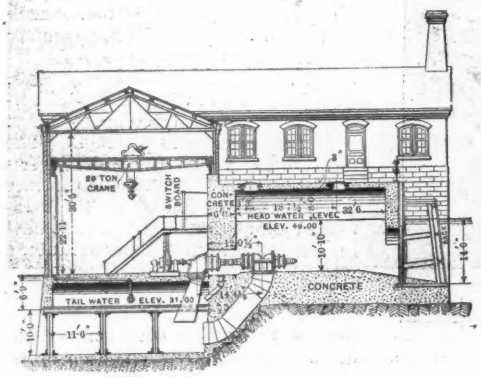

FIG. 11.—SECTION THROUGH EXCITER-WHEEL CHAMBERS.

The exciters are placed one on each side of the stairway leading to the switchboard gallery. They are six-pole, 100-kilowatt, 125-volt standard General Electric machines, with ribbed field frame and iron-clad armature. The switchboard, erected on a gallery on the north wall of the dynamo-room, is built up of nine highly polished panels of blue Vermont marble, each panel seven feet six inches high, three feet wide and two inches thick. Of these nine panels five are used for the generators and two for the feeders; one is the total output panel, and the last is for the control of the exciters. The lead-covered leads from the generators are taken out at the base of the machine, and are laid in ducts in the floor. Rubber-covered wire is used for the field connections. The cables rise on a frame from the duct to the floor of the gallery, through which they rise to the board. From the back of the board the line wires rise to supports bolted to the I beam on the north wall, which supports one of the crane runways. The lines run along the north and west walls and pass out to the poles through a blind window over the door of the power-house.

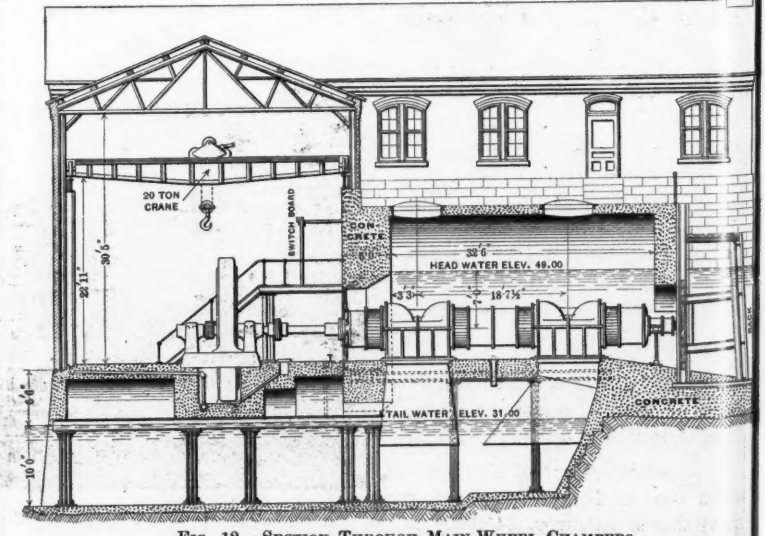

FIG. 12.—SECTION THROUGH MAIN-WHEEL CHAMBERS.

The line from Mechanicville to Schenectady is the only one at present laid down. It consists of three 000 Brown & Sharpe bare wires. The circuits are carried on poles 30 to 60 feet long, and all eight inches in diameter at the top. Each pole carries one cross-arm, on one side of which are two porcelain insulators of the triple petticoated type, a third being on the other side. The line takes a westerly direction to East Glenville and then due south to Schenectady. At the end of the Glenville bridge over the Mohawk, the town limits, it is carried down to the ground and connected to three cables of No. 1 gauge stranded copper insulated by one-fourth inch rubber and three-thirty-seconds lead sheet laid in terra-cotta conduits. These cables run 1,700 feet along Washington avenue, rise to poles again through Rotterdam street to the Erie Canal, and along the canal to a point directly opposite the General Electric Company's power station. They then cross the canal and enter the works. The introduction of this transmitted electrical power into the factory will work a considerable change.

The officers of the Hudson River Power Transmission Company are Gen. Edmund Hayes, of Buffalo, N. Y., president; R. N. King, president of Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, vice-president; G. M. Furman, Newark, N. J., treasurer; Mr. E. J. Richards, Boston, Mass., superintendent; J. S. O'Shea, manager. In all details this entire plant has been carefully worked out, and its operation will be watched with much interest by the power-using and investing public.

ELECTRIC RAILWAY NOTES.

The Monmouth Traction Company expects to have its trolley line between Bordentown and Trenton, N. J., in operation by the last of September.

The annual statement of the Bridgeport, Pa., Traction Company shows that its surplus for the past year was $69,271, an increase of $25,594 over the previous year.

The Louisville, Ky., City Railway Company has agreed to pay $30,000 license tax pending a decision on the city's suit on the franchise tax. A compromise is probable.

The earnings of the Metropolitan Street Railway Company, of New York, showed an increase of $105,000 for the first 20 days without the Sixth and Eighth avenue lines.

The street car company of Butte, Mont., has asked for a franchise to haul freight over its lines. In return for this concession it offers to pay the city a royalty on freight receipts, and to reduce all passenger fares to five cents.

Owen McCusker has entered a suit against the Citizens' Traction Company, of Pittsburgh, Pa., to recover $10,000 for injury to buildings on Penn avenue, caused by the operation of the power-house at Thirty-third street. It is claimed the machinery shook the building of the plaintiff.

Otto C. Haarer, through Adolphus Haarer, has instituted suit against the Capital Railway Company, of Washington, D. C., for $25,000 for injuries received in the accident which occurred on that road July 10, 1898. The injury he received, it is claimed, necessitated the amputation of his right foot.

It is reported that a corps of surveyers have been working east of Ypsilanti, Mich., laying out a new electric road to parallel the Detroit, Ypsilanti & Ann Arbor line. It is said that the Michigan Central Railroad is promoting this new road, having found the competition of the electric road very severe.

The annual report of the Middletown-Goshen, N. Y., Traction Company shows: Earnings, $45,090; net, $7,742; other income, $1,530; charges, $21,482; deficit, $12,210; total surplus, June 30, 1898, $3,078. Assets of $571,543 include $565,010, cost of road and equipment, and $2,300 cash on hand. Capital stock is $275,000, and funded debt $3,078.

The Los Angeles, Cal., & Pacific Electric Railway Company has decided to make a reduction of 12 minutes in the time between this city and Pasadena. This change will go into effect in a few days, and later in the season the company will put on 16 new cars in addition to those already in service, including eight fast express flyers. The improvements recently made at the Pasadena power-house will cost nearly $50,000, which includes a 650-horse-power engine.

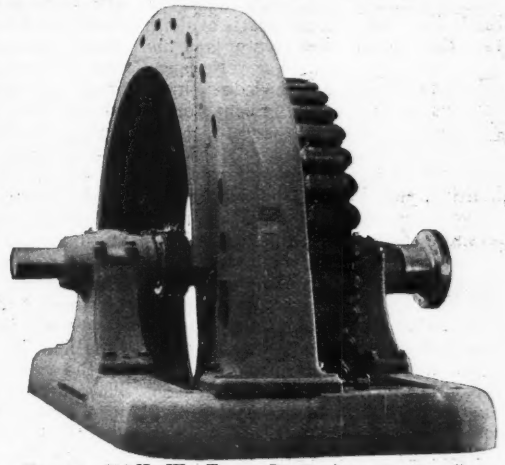

FIG. 13.—750-K. W., THREE-PHASE ALTERNATOR—REVOLVING FIELD UNCOVERED.

FIG. 14.—A SHIPMENT OF VICTOR TURBINES.

The East St. Louis & Collinsville, Ill., Electric Railway Company, which was recently incorporated for the purpose of building a railroad from East St. Louis to Collinsville, has sold out to the Mississippi Valley Electric Railway Company, of St. Louis. The company will construct two lines from East St. Louis to Edwardsville, one via Venice, Brooklyn, Granite City, Madison and Alton, and the other via Collinsville and Glen Carbon.

Another Trolley Decision.

Judge Lacombe of the United States Circuit Court, for the southern district of New York, issued on August 25 preliminary injunctions on the Condict patent controlled by the General Electric Company against the Nassau Electric Railroad, of Brooklyn, enjoining the further use of the electric car controllers, which were made by the Steel Motor Company, and against the Walker Company, enjoining its manufacture of the several types of series parallel car controllers made by it.

The operation of this injunction is suspended until the next session of the Court of Appeals, giving the defendants an opportunity for appeal.

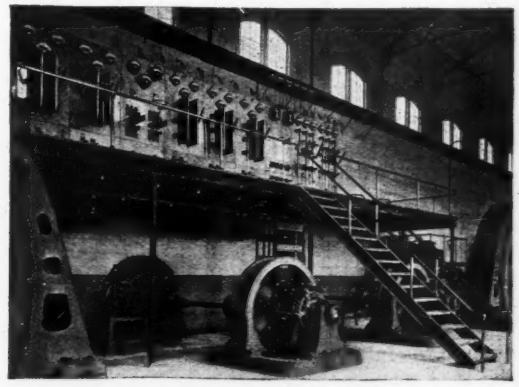

FIG. 15.—EXCITERS AND SWITCHBOARD.

ELECTRIC LIGHT FLASHES.

The Merchants' Association, of San Francisco, is considering the question of a municipal electric light plant.

The report of the Norwalk & South Norwalk Electric Light Company shows: Capital, $64,000; real estate, $20,000; personal estate, $164,903,89; debts, $8,584.85; credits, $6,966.85.

At the annual meeting of the Steelton, Pa., light, heat and power company the following directors were elected for the ensuing year: Samuel Couffer, Jerome Hite, John Hess, F. E. Smith, J. J. Barnet, Dr. W. H. Seibert, Joseph A. Fletcher, Michael Harclerode and G. E. Coulson. The directors afterward met and organized. Samuel Couffer was re-elected president; C. E. Keller, secretary, and G. E. Coulson, treasurer. The board declared a dividend of two per cent on the capital stock, payable to the holders September 1.

The Electric Light and Power Company, at Tuskaloosa, Ala., has been enlarged to double its former capacity, and has attached to its plant a 20-ton ice machine, which will be operated by a common outfit of machinery and power.

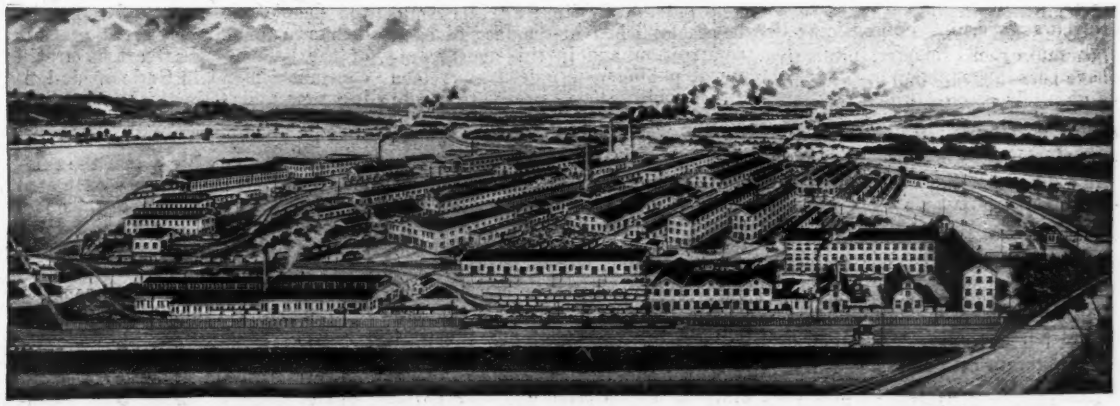

FIG. 16.—THE SCHENECTADY WORKS, GENERAL ELECTRIC COMPANY.

INDUSTRIAL AND COMMERCIAL EDUCATION AND OUR MATERIAL PROSPERITY.

ABSTRACT OF A PRESIDENTIAL ADDRESS READ BEFORE THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION, BOSTON, AUGUST 18, BY PROF. J. B. JOHNSON.

The material prosperity of any country is the foundation of the happiness and of the progressive enlightenment of its people. To learn the essential conditions of such a prosperity, therefore, is a matter of supreme importance. I invite your attention to-day to what I conceive to be some of these essential conditions, so far as these conditions consist of educational opportunities and advantages, so far as they are properly presented to, and considered by, this society, which now very largely directs the present methods and will direct the future policy of the technical instruction in America. In approaching this subject we are at once impressed with the conviction that the teachings of history are not available to serve as a guide in this matter. In the former times all knowledge of material things was traditional and had to be learned by the traditional methods; to-day nearly all such knowledge is scientific, and should be acquired by scientific methods. Prosperity, or even supremacy, in material things in the past is therefore no promise of such a position in the future, and as a proof of this we have but to compare the past achievements of England and its present subordination to Germany.

For the past 300 years England has labored systematically to encourage all her sources of material prosperity. By special charter to commercial and manufacturing companies; by elaborate laws governing apprentices; by high, and often exclusive, protective tariffs; by subsidies and by exclusive trading privileges granted to navigation companies; by the importation of skilled workmen from Holland; by receiving the Huguenot refugees from France, and by the prevention of the emigration of skilled mechanics; by her coal and iron deposits; by her early development of the steam engine and its application to the various industries, including railroads and steamships; by the industrious habits and the aggressive disposition of her people; by her honesty in governmental and business relations; by parliamentary commissions without number, and with a continuous and consistent policy on the part of the whole people of England, she succeeded finally in absorbing most of the manufacturing and in carrying nearly all of the commerce of the world. Finally, by adopting a free trade policy, when her interests were mostly centered in foreign countries, her manufacturing industries obtained such an impetus that it seemed England would long remain the leading manufacturing country of the world. In this conviction her people have placidly followed in the footsteps of their fathers, well assured that nothing could shake the commercial Gibraltar which they had caused to regard as a natural inheritance.

But behold the great awakening! Across the Channel a score of small kingdoms of like ancestry had been slowly preparing for the most astonishing things. In the throes of the Franco-Prussian war a great nation experienced a new birth, leading to such a series of material achievements as the world has never witnessed before. Within 12 years of the date of this new birth a Royal Commission from England, after a most careful study of the situation, reports that England has everything to fear and many things to learn from her new rival. The situation grows annually more acute, and to-day England finds herself about to lose her position forever as the leading manufacturing and commercial nation of Europe. This explanation of this remarkable transition is deserving of the most careful study, and it is of peculiar interest to the members of this society. That an interior country like Germany, without a navy, and with little foreign commerce, could in a quarter of a century increase her manufacturing capacity tenfold and make it equal to that of England; increase her shipping twentyfold, making it a second to that of England; effectually establish a regular export trade with every country on the globe, and by at once cheapening products and improving their quality put herself in a position to hold these markets indefinitely; that all this could be accomplished in the face of open competition, and in this age of universal publicity, is indeed marvelous and would alone prove that old methods have lost their potency and that something new has arisen under the sun.

When we seek an explanation of these wonderful achievements we find only a rational and provident application of means to ends, but on the most gigantic scale, and persevered in far more consistently than has ever before been even planned, to say nothing of execution. For the past 25 years Germany has been systematically teaching her people in every kind of commercial and industrial employment. When industrial capacity rested wholly upon traditional and empirical knowledge and upon manual skill, it was essential that artisans should obtain all this knowledge and skill as apprentices. But since nearly all processes of the artisan have now a scientific and rational basis, and new industries are daily established, founded on some new discovery or invention; and since the demand no longer determines the supply, but new and improved supplies are constantly creating their own demands in all lines of industry, it is evident that the efficient direction of any industry to-day demands a very large amount of technical knowledge which can not be learned at the bench or in the shops.

While self-education is always possible, the obstacles are commonly prohibitive, and at best the results are meagre and unsatisfactory. There is no more costly luxury than an inventive but ignorant superintendent. Germany has seen this situation most clearly, and it is to her clear perception of this problem, and her rational and thorough solution of it, that has raised her industrially from poverty and obscurity to wealth and fame in the short period of a quarter of a century.

Germany was the first to perceive that by the application of steam power to industrial production the capacity for such production by a single country is almost unlimited. Thus any one of the leading industrial nations could easily produce enough of the more readily transported products to supply the entire world, and the amount any one nation will succeed in supplying depends wholly on its relatively superior knowledge and on its facilities for manufacture and sale. The material prosperity of any country, in the immediate future, therefore, will be determined far more by the intelligent direction given to its industrial pursuits than by either its natural advantages in raw material and transportation facilities or on its past achievements in any particular direction. The common people the world over are being worked over into one type of manners and customs, their æsthetic tastes developed and their wants indefinitely multiplied. Here again the improved supply is creating the demand, and the more this supply is made to conform to the growing refined and artistic tastes of the people the greater becomes its demand. The highest artistic talents of the best industrial artists are in constant demand in Germany designing new and attractive patterns of form and color and texture to meet this rapidly developing taste of the common people. And it is the common people who must be considered in manufacturing. These compose the great bulk of society and fix the demand for the great staples of production.

Seeing, therefore, that the capacity for production is limited only by the intelligence and foresight of a people, and that there is a rapidly growing and prospectively unlimited demand for all kinds of artistically manufactured goods, Germany set to work some 25 years ago to supply this demand by the intelligently directed labors of her own people. This had long been the home of classical and military learning, but it now became also the very center and head of technical and industrial education. The members of this society are all quite familiar with her high-grade engineering schools, but are not so familiar with her industrial schools. In fact, we have commonly spoken of these with more or less indifference, calling them trade schools. They are, in fact, schools of applied science, and they pass in Germany under the very appropriate name of "Mono-Technic" schools. Such schools are there found for all the leading industries of the empire, and there are many schools for the same industry. Thus, there are in Germany 13 schools devoted to the textile industries, each with its peculiar organization specially adapted to the region in which it is placed. As little duplication as possible is practiced, and when the same field is covered in two or more schools variations in methods are introduced for the purpose of comparing results. The students entering these schools have first to complete the course of study in the "Real Schools"—or, say, through the sophomore year of our engineering schools—and then the course of study in the mono technic schools is three years of 45 hours a week, on the successful completion of which certificates are granted. The fine and costly buildings in which these schools are installed; their elaborate equipment, with all the needful chemical and physical laboratories, and machinery to convert them into regular commercial factories; their large corps of trained teachers and the very small number of students admitted to take their full courses; the administrative care and oversight given to them, and their very small tuition fees, all serve to make the training given in them extraordinarily expensive to the state. Thus the textile schools of Crefield had first year only 108 regular day students in the weaving school and 40 in the dyeing and finishing school. In the weaving school was the director, with 15 assistant lecturers and six other assistants; in the dyeing and finishing school there were the director and three assistant lecturers, a special chemist for dyeing and for finishing, or a force of 29 instructors for 148 regular students. There were, however, irregular students in attendance on night and Sunday courses. The plant of this school included extended chemical and physical laboratories fully equipped, drawing-rooms, lecture and testing-rooms, chemical museum, library and reading rooms. The mechanical equipment was that of a complete weaving, dyeing and finishing works for all the finer grades of woolen and silk goods. Commercial work is done on a large scale, the students doing the work under the direction of the assistants. Specially difficult tasks in dyeing are here undertaken and successfully accomplished, and regular consignments of this character are made by some of the leading factories of the empire.

This school is only one of hundreds in Germany which are training up a class of men for the direction of all kinds of industrial works in which

scientific knowledge is finding its embodiment and application. As a result of this training, we find such great industries as the aniline and soda works at Ludwigshafen, on the Rhine, which has grown from employing a total force in 1865 of 30 people to employing 5,000 men, and over 100 trained chemists in 1897; also the optical and electrical works of Schuckert & Company, of Nuremberg, which started on a very small scale in 1882, but which now employs over 4,000 men, besides a large scientific staff, and which had in 1897 unexecuted orders on hand aggregating $18,000,000. Three fourths of all the coloring matters and pharmaceutical products now produced from coal tar is made in Germany, their total annual products of this class aggregating $40.000,000. The earliest chemical discoveries of these products were made in England, but there was not sufficient knowledge of applied chemistry in that country to utilize these discoveries. It is such examples as these, of which there are many, that indicate that Germany is reaping the fruits of the painstaking and far-seeing policy she has entered upon, and if other nations wish to share her prosperity they must act with a like wisdom and determination. The proof that Germany's remarkable industrial prosperity is traceable very largely to her educational methods is so patent to the people themselves that they voluntarily unite to support schools in their particular trades. Thus, of the 248 mono-technic schools in Prussia alone which are so supported, the painters and decorators have 32, the shoemakers 9, the tailors 16, the bakers 20, the butchers 6, the smiths 26, and so on. Every trade has its own schools aside from those supported by the state and by the municipalities. The stability of her governmental policy and the fixedness of her currency and financial basis, and the disposition to be satisfied with small wages and profits, so long as these both rest on a sure and permanent footing, contribute largely to Germany's present material prosperity, but these advantages are held with her in common by some other countries which are not sharing her present prosperity. It is not her army of soldiers which other nations need to fear, but her army of scientifically trained directors of industrial enterprises and of the highly educated commercial agents at which they may well tremble.

They not only educate the men who manufacture, but they are also beginning to look well to the training of men who are to carry their goods to the ends of the earth and report back the peculiar needs of every locality. Schools of commerce are being organized, modeled after those of France and Belgium, in which, in addition to what is taught in our "commercial colleges," will be found a speaking and writing acquaintance with several foreign languages, especially English, Spanish and French, if these have not already been acquired; political economy; industrial tariff, and patent laws; railroading; shipping; postal and telegraph regulations; banking, exchange, coinage and national schemes of finance; industrial history; commercial geography, etc. A German national conference was held on this subject a year ago and a new system of commercial education is now being established all over the empire. Modern languages form a part of the elementary school training, especially English, so that the entering students in these schools are likely to be well equipped in this particular. With such material as these schools will turn out, their students coming from the better mercantile classes, and having the manners and bearing of gentlemen, the large manufacturing and mercantile houses can establish branches in all the leading foreign countries, and with the system of foreign German banks which are even now found everywhere, the conditions are ripe for the ready and rapid sale of German products in all parts of the world.

But you may say, what is all this to us? Have we not the finest system of public schools in the world? Have we not any number of manual training schools and numerous Pratt and Armour Institutes? And, finally, have we not a great many engineering schools as good as the best, even in Germany? And have we not "commercial colleges" without number? Suppose that I grant all this, may I not still say that the common schools give no special preparation for any kind of employment; that the manual training schools likewise fit for nothing in particular; that our engineering schools fit for very narrow lines of professional employment and commonly educate men away from the industrial pursuits rather than toward them; and, as for our so-called commercial colleges, what do they teach beyond arithmetic, bookkeeping, stenography and typewriting? Where, then, does the scientific training for the manufacturing and commercial industries come in? I submit that it does not come in at all. It has been well said that America is but another name for opportunity. This is true. Never before in the history of the world has man had such fabulous opportunities for material good as we have had given to us in this glorious land. Nowhere else on the face of the globe is there such a land, but we have exhausted a large portion of our lands by spendthrift and improvident agricultural methods; we have squandered our forest resources; we have wasted our natural gas supplies: we have trifled with our finances; in short, we have run the race of the prodigal son and are now beginning to come to ourselves and to ask if there are not better methods of administering our heritage to be learned in our father's or, as I am insisting to-day, in our grandfather's house.

The most essential conditions of our future material prosperity, therefore, are a specific scientific training for the directors of each and every kind of manufacturing and commercial activity. This is the burden of my address; the imperial and paternal government of Germany has worked out this problem to a most fruitful issue, but probably no other country could duplicate it. England has been trying for 10 years to do so, but with very poor success; instead of highly educating a few leaders and directors of industry and commerce, they are vainly trying to raise the whole class of apprentices and clerks by a wholesale system of shallow night-school instruction. Surely a duplication of the imperial German system is not to be thought of in this Union of 45 independent states. The great question for us to solve is how to obtain a corresponding specific training for our industrial officials. The problem is not without its difficulties, and before anything is done or even recommended, the whole question should be looked into by a commission appointed, preferably by the national government, through the bureau of education. Should not this society take the initiative in such a moment? I believe it should. I believe the future material prosperity of this country is very largely dependent on how we solve this problem. Let us remember that we can no longer judge of the future by the past; to-day both the successful manufacture and the sale of goods are reduced to exact sciences. Old things are done away and all things have become new. Let us see to it that our ship of state shall be guided by the lights which are now so successfully leading others through the channels of progress, rather than to continue to steer by the vanishing lights of a unique and tortuous past which may soon land us on the sandy banks of delusion and improvidence.

About Advertising.

[*From Town Topics*]

What does a prudent advertiser pay for? Publicity. What sort of publicity? That which will be profitable to his business. This is not to be gauged by the number of copies of a paper that are printed, but by the class of people that buy the paper. Suppose that a one-cent journal has 1,000,000 circulation among the poor people on the east side of town; what good would that do to the advertiser of a fine brand of champagne, or a new grand piano? Out of the million of readers, not one would ever purchase champagne or a piano. The money wasted upon the advertisement would have done more good had it been thrown into the gutter for gamins to scramble over. The alphabet of advertising begins with the plain truth that the best medium is the paper that reaches the people who have the purchasing power. This once secured the rest is easy, and depends largely upon the excellence of the goods that are advertised.

Our Paris Correspondent Corrected.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have just read with great interest, on page 99 of your issue of August 17, a very chatty and interesting article on "Electric Traction in Paris," and I beg to call your attention to a very serious error in the description. At the top of the last column on page 99 the writer states, "I refer to the engine-room; three high-speed Armington & Sims engines are at present in use, but two more are shortly to be added, etc."

One glance at Fig. 2, on the second page following, shows three Willans central valve engines direct-coupled to French dynamos. How is it possible for your correspondent to make such an error as this? Armington & Sims build nothing but horizontal high-speed engines. Please correct this statement for your own sake, as well as for the purpose of doing the English manufacturers of the central valve engine due justice.

Very sincerely yours,

M. C. BULLOCK,

Chicago, August 19.

Questions on Electrical Transmission.

TO THE EDITOR OF ELECTRICAL REVIEW:

Referring to communication on page 97 of your issue of August 17, 1898, signed by James Asher, a pertinent inquiry might be: What would be the effect if the "transformer having its primary and its secondary coils of equal length" was left out entirely? Also, what would be the saving of expense? The same inquiry would apply to the "rotary transformer, which both receives and generates continuous currents of equal voltage." JNO. H. NOBLE.

Pittsfield, Mass., August 18.

That Electric Gun.

[*From the Des Moines, Iowa, Capital.*]

An inventor describes in the ELECTRICAL REVIEW a new gun constructed by him, which he says will throw 3,600 projectiles per hour by electrical force from Key West to Havana. This inventor, like the fellow who has the bullet-proof jacket, was careful to keep his invention in the background until after the close of the war. Like a submarine boat, this electrical gun will be in evidence until the outbreak of another war.

The through telegraph line between Lisbon and Paris, recently completed, is now in service.

ADVANCE INFORMATION

New Electric Railways.

HARRISBURG, PA.—A charter has been issued to the Hatboro & Horsham Electric Railway Company to erect a line one and one-fourth miles long. The company is capitalized at $75,000, and the directors are Magnus Hellstrom, president, Philadelphia; James Crawford, Alfred R. Grandy, Philadelphia; John B. Peddle, Woodbury, N. J.; S. Edward Hagar, Doylestown.

DURAND, MICH.—A franchise has been granted to the Long Lake, Durand & Corunna Electric Street Railway Company.

SODUS POINT, N. Y.—Rochester & Sodus Bay Railway Company, incorporated by George E. Merchant, Walter B. Duffy, Thomas J. Nicholl, Daniel G. Clapp, George Wilder and others, to operate by electricity, compressed air or other power, except steam, a railroad line, 41 miles long, from Sodus Point, Wayne County, to Rochester; capital stock, $1,000,000.

LANSING, MICH.—Capitalists from Detroit contemplate building an electric railway from this place to Pine Lake.

LANSING, MICH.—The Saginaw & Frankenmuth Railway Company has been incorporated by Henry C. Potter, Jr., James B. Peter, Samuel G. Higgins and William J. Bartow, to build an electric road; capital stock, $50,000.

PITTSBURG, KAS. — A company with the right to build an electric line of railway between and through the cities of Iola, Humbolt and Moran, Allen County, filed its charter Tuesday in the office of the secretary of state. It is to be known as the Iola Rapid Transit and Electric Light Co., and in addition to building railway lines will have authority to put in electric light plants and secure franchises. The capital stock of the company is $10,000, and the directors are W. S. Hendricks, G. A. Berolus, W. J. Evans, J. E. Chastain, L. S. Northrup, A. W. Beck and E. K. Taylor.

BENTON, ME. — Work has been begun on the construction of the new electric road from Benton Falls to this place, a distance of three miles.

CORUNNA, MICH.—A franchise has been granted to the Long Lake, Durand & Corunna Electric Street Railway Company. The franchise provides that the work of construction shall be started within three months from date, and road to be in operation by January 1, 1900. The powerhouse and car stables are to be located at Durand.

PLYMOUTH, MICH.—The powerhouse for the Detroit, Plymouth & Northville Electric Railway is completed. The road will be in operation by September 15.

NATICK, R. I.—The new electric railroad which will connect the city of Providence with the Pawtuxet Valley villages will be in operation about November 1, and the work of building the new bridge which will cross the Central and Pawtuxet Valley branches of the New York, New Haven & Hartford Railroad between Westcott and this place will be commenced immediately and the work of building the new structure will be completed in about four weeks' time.

New Telephone and Telegraph Companies.

ABERDEEN, S. D.—A new telephone company has been organized here under the name of the Central Dakota Telephone Company. It will build and operate a telephone line from Brookings to Pierre, with side lines branching out to all towns of any importance on either side.

MANKATO, MINN.—The Mankato Citizens' Telephone Company awarded the contract for installing a 200-'phone plant in the city to H. M. Kellogg, for about $7,000. The contract is to be completed within 90 days.

LITTLE ROCK, ARK.—The American Telegraph and Telephone Company has been incorporated, Clifford H. Strong, representing the trustees for the New York capitalists; Gray Carroll and Thomas S. Busbee are the incorporators. The capital stock, all paid up, is $10,000.

JEFFERSON CITY, ARK. — The Mountain Home & West Plains Telephone Company has been incorporated; capital stock, $5,000.

HARTFORD, CT. — The Southern New England Telephone Company has obtained permission to build a new line on the east side of the Thames River from Norwich as far as the navy yard.

QUAKER CITY, OHIO—The Quaker City Telephone Company has been incorporated, to build and operate a telephone line; capital stock, $500. The incorporators are John R. Hall, J. W. Hill, H. S. Hasbley, J. L. Douglass, I. P. Steele and C. W. Eberle.

EPPING, NEB.—A new telephone exchange has been organized at this place.

DUQUOIN, ILL.—The Perry County Telephone Company has been incorporated; capital stock, $12,000; incorporators, C. L. Downey, Robert O. Lehn and J. J. Downey.

MONTEZUMA, GA. — The Montezuma Telephone Company has been incorporated by Jule Felton and Mrs. C. H. Maxwell for the construction of a telephone exchange; capital stock, $1,000.

VINE GROVE, KY.—The Winchester & Lexington Telephone Company has been incorporated by T. C. Vanmeter, David Prewitt and S. D. Goff; capital stock, $1,560.

WEST PLAINS, MO.—The Mountain Home & West Plains Telephone Company has been incorporated to construct a telephone system from Mountain Home to this place; capital stock, $5,000.

NEWTON, KAS.—The Newton Telephone Company, A. R. Champlin, manager, has decided to build a long-distance telephone line from this city to Moundridge.

ROCKWOOD, MICH.—The People's Telephone Company, of Wayne and Monroe counties, will extend their line next to Scofield, Maybee and Monroe.

EMERSON, NEB. — The telephone line connecting this place with Bancroft has been completed, and this place is now directly connected with Omaha.

New Incorporations.

NEW YORK, N. Y.—The H. W. & M. Electric Company has been incorporated; capital, $25,000; directors, Charles Hagedorn, of 227 Thirteenth street, Brooklyn, and two others.

TUNKHANNOCK, PA.—The Keystone Electric Construction Company, with a capital of $10,000, has been incorporated.

PARSONS, PA.—The Standard Electric Company, with a capital stock of $40,000, has been incorporated.

CHESTERFIELD, N. Y.—The Keeseville Electric Company has been incorporated. The company intends to manufacture electricity for public and private use in Essex and Clinton counties; the capital is $30,000. The directors are Orville S. Morse, Henry M. Prime and A. W. Boynton, of Keeseville; George F. Morse, of Peru, and Henry E. Barnard, of Plattsburg.

WORCESTER, MASS.—The Bay State Motor Company has been incorporated; S. F. Burlingame, president; W. W. Hobbs, treasurer; capital, $10,000.

NEW YORK, N. Y.—The Wetmore Electric Company has been incorporated by George W. Pulver, Jacob Strife, Oliver P. Hedden and Thos. Glenn, to operate in the towns of Lowville, New Bremen and Croghan, and the villages of Lowville and Croghan; capital stock, $40,000.

Electric Light and Power.

NEWPORT, PA.—The Perry Electric Light, Heat and Power Company, with $13,000 capital stock, has been incorporated; incorporators are A. D. Van Dyke and S. S. Leiby, Marysville; J. K. Van Dyke and John H. Smith, Philadelphia, and J. S. Leiby, Newport.

LOVELAND, OHIO—The Loveland Power and Electric Light Company has been incorporated; capital stock, $10,000; incorporators, I. W. Newcomer, C. C. Strickleman, W. H. Stubbs, H. A. Cayne and R. B. Corwin.

MORROW, PA.—The Morrow Power and Electric Light Company, with a capital stock of $10,000, has been incorporated.

WATERTOWN, S. D.—The City Council has granted the privilege to O. M. Kirlin and others for the putting in of an electric light plant for lighting the city.

NEW PAYNESVILLE, MINN.—The contract for the building of an electric light and waterworks plant at this place has been awarded to W. I. Gray & Company, of Minneapolis.

PERHAM, MINN.—City Clerk may be addressed concerning establishment of electric light plant.

FARGO, N. D.—E. A. Hughes may be addressed concerning establishment of electric light plant.

TALLAHASSEE, FLA.—The Mayor may be addressed concerning contemplated establishment of electric light plant.

ARLINGTON, GA.—The Mayor may be addressed concerning establishment of an electric light plant.

WORTHINGTON, IND.—Worthington Water and Light Company has been incorporated, with a capital stock of $5,000.

WICHITA FALLS, TEX.—City Clerk may give information concerning contemplated establishment of electric light plant.

GALLATIN, TENN. — The Mayor may be addressed concerning proposed erection of electric light plant.

WINCHESTER, VA.—William R. Willis may give information concerning contemplated erection of electric light plant.

CLINTON, MICH. — The electric light plant at this place is to be enlarged.

Increase of Capital.

SHARON, CT.—The Sharon Telephone Company has increased its capital from $3,000 to $6,000.

KIND WORDS.

AS USUAL!

TO THE EDITOR OF ELECTRICAL REVIEW:

I read the last issue of the ELECTRICAL REVIEW with very great interest, and wish to compliment you on the publication of such an excellent paper as you have produced.

Possibly it is an increasing interest in your paper, but whatever it may be, you seem to be improving rapidly in the character of matter it embodies.

I do not mean by this that the matter was ever poor, but simply that it seems to me to be better than formerly. J. F. STEVENS.

Philadelphia, August 18.

Rooster Luckier Than Cervera.

A rooster in Limestone, Me., was struck by lightning and deprived of all its tail feathers save two. The chanticleer survives the shock, and the owner has christened him Cervera. —*New York Sun.*

Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 16, 1898.

(*Continued.*)

609,245 Electrical circuit-controller; Nikola Tesla, New York city—Consists of a receptacle of a conductor or series of spaced conductors, a nozzle or tube for directing a jet or stream of fluid against the same, the nozzle and conductor being capable of movement relatively to each other and means for maintaining a circulation of conducting fluid, contained in the receptacle, through the said nozzle and dependent for operation upon such relative movement.

609,246 Electric circuit controller; Nikola Tesla, New York city—A circuit controller comprising in combination means for producing streams or jets of conducting liquid forming the terminals, and means for bringing the jets or streams of the respective terminals into intermittent contact with each other.

609,247 Electric circuit controller; Nikola Tesla, New York city—Comprises a closed receptacle containing a fluid, means for rotating the receptacle, a support mounted within the receptacle, means for opposing or preventing its movement in the direction of rotation of the receptacle, and a conductor carried by said support and adapted to make and break electric connection with the receptacle through the fluid.

609,248 Electric circuit controller; Nikola Tesla, New York city—Consists of a rigid terminal, of means for directing against such terminal a jet or stream of conducting fluid in electrical connection with the other terminal, and a body adapted to be intermittently moved through and to intercept the jet or stream.

609,249 Electric circuit controller; Nikola Tesla, New York city—Consists of a closed rotary receptacle, a rigid conductor mounted within the same and through which the circuit is intermittently established, and means for directing a jet or stream of a fluid, which is contained in the receptacle, against the said body so as to effect its rotation independently of the receptacle.

609,250 Electrical igniter for gas engines; N. Tesla, New York city.

609,251 Electric circuit controller; N. Tesla, New York city—Comprises a receptacle containing a fluid, means for rotating the receptacle, and a terminal supported independently of the receptacle and adapted to make and break electric connection with the receptacle through the fluid.

609,252 Electric rail-bond; J. S. Tucker, Chicago, Ill.—A rail-bond comprising a conductor having its end portions provided with inwardly-tapering enlarged heads, said heads being provided at their inner or smaller ends with flanges.

609,274 System of control of electric motors; E. R. Gill, Englewood, N. J.—A power regulator, a controlling actuator, an engagor adapted to cause frictional engagement between said regulator and said actuator, means for automatically interrupting said engagement and an adjustable retarding device attached to said regulator.

609,292 Switch and switch-operating mechanism; J. P. Orr, Pittsburgh, Pa.—A switch comprising a tongue, a track section, electrical means for moving said tongue and track section vertically, one section being moved downward as the other section is moved upward, and means carried by a car for opening and closing the electrical current.

609,298 Primary battery; W. Rowbotham, London, England.

609,309 Fire-alarm; H. Tersling, Copenhagen, Denmark—A casing, a crank shaft projecting out thereof, an alarm, gearing connecting the alarm with the crank shaft and driving the alarm therefrom, electric circuit-closing mechanism, a motor for operating the same, the motor being controlled by the crank shaft, and a stop pawl released by the movement of said circuit-closing mechanism and engaging the gearing for operating the alarm, whereby to stop the alarm.

609,331 Telephonic measured service system; W. W. Dean, Boston, Mass.—Consists of a subscriber's circuit connecting two sub-stations with a central station, call-sending devices at the sub-stations, call-answering devices at the central station, and two call-registering mechanisms associated with said circuit at the central station, actuated by the normal operation, successively of the call-sending devices of either station and the central call-answering devices, for discriminatively counting and registering the calls of the said sub-stations.

609,356 Electrical conduit-box; Hubert Krantz, New York, N. Y.—A split conduit-box provided with corresponding semi-circular rims on the two parts of the box to form the outlet openings for the conduits, with closing disks held in place by the two parts of the box when fitted together.

609,374 Telephone repeater or relay; J. S. Stone, Boston, Mass.—A telephone relay, comprising an electro-magnet, transmitting electrodes in a second circuit, a diaphragm common to both said electro-magnet and said transmitting electrodes, and a vacuum chamber enclosing said magnets, electrodes and diaphragm.

Leave Grand Central Station, New York, at 8.30 A. M., on the Empire State Express, via New York Central in connection with Michigan Central "The Niagara Falls Route," arriving Chicago 7.50 A. M. Dining car serves dinner leaving Buffalo. For full information inquire of New York Central Agents, or write W. H. Underwood, General Eastern Passenger Agent, Buffalo, N. Y.

IRON ROOF FOR SALE.

Width of building 155 ft, out to out, divided into a center span 66 ft., with a wing on each side 43 ft., 6 in.; total length of the building, 350 ft. This building is designed with brick sides and gable walls, with iron roof trusses and iron supporting columns; originally built for an iron foundry, but owing to the failure of the purchaser is now offered for sale at a bargain. Is admirably adapted for a foundry for light or heavy castings, machine shop, car barn, or for any other general manufacturing purposes. We guarantee the iron work as good as new, building never having been used.

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THE BERLIN IRON BRIDGE COMPANY,
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Site suitable for Power-House or similar use to lease for long term of years. Ground 84x84, within one block of BROADWAY, NEW YORK. Fronting on three streets, more ground adjoining could be acquired. Is high and dry, permitting basement thirty feet deep. Basement could also run under sidewalks of all three fronts. Apply to

HAWLEY & HOOPS,
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THE "Demary" Switch

has a locking device, making it impossible to open until full tension of spring is obtained; this prevents dragging and insures an absolutely instantaneous break. All parts interchangeable. Every switch guaranteed free from defects of work or material. Ask for photograph and prices.

R. C. DEMARY,
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AGENCIES ALL OVER THE WORLD.
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OCCIDENTAL & ORIENTAL S. S. CO. / PACIFIC MAIL S. S. CO. / OCEANIC S. S. CO. — San Francisco to Japan, China and Australia.
MORGAN STEAMSHIP LINES — New York to New Orleans. New Orleans to Texas. " " " Florida. " " " Havana. " " " Central America.
HOUSTON & TEXAS CENTRAL R'Y., SAN ANTONIO AND ARANSAS PASS R'Y CO., to Fishing and Hunting Grounds and all other points in Texas.
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EDWARD S. DUVALL,
Solicitor of Patents,
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Some time connected with the late Benjamin Butterworth, before he retired from practice to assume the office of Commissioner of Patents.

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Kindred.... ...Interests

The Mica Insulator Company, of New York and Chicago, has issued a catalogue giving a great deal of interesting information on mica.

The Warren-Medbery Company, Sandy Hill, N. Y., report a very satisfactory business and a constantly growing demand for the improved Warren inductor alternator which they manufacture.

The Stromberg-Carlson Telephone Manufacturing Company, Chicago, is reporting a large demand for their divided-circuit toll-line system for new lines, as well as for re equipping the ordinary bridging system.

The American Impulse Water-Wheel Company, 120 Liberty street, New York city, has issued a new collection of water-wheel circulars, handsomely bound in pamphlet form. The information contained is reliable and valuable, and the circulars may be had on application.

The W. C. Young Manufacturing Company, of Worcester, Mass., are the makers of lathes, punches and shears that are particularly suitable for electrical factories. The offices of the company are located at 19 Hermon street, in Worcester, and catalogues will be sent on application.

The New Haven Car Register Company will exhibit one of their counting machines at the Boston Street Railway convention next month. These machines are made in the same excellent manner as the fare register One of the registers has registered 14,316,100 times and is still at it. This is durable apparatus as well as skilled workmanship.

Julius Andrae & Sons' Company, of Milwaukee, have secured the agency for the Ericsson telephones in the Badger state. Mr. James Healey, who recently returned to Milwaukee from a trip through northern Illinois in the interest of the Julius Andrae & Sons' Company, states that the business conditions in the rural districts are very favorable. The splendid crops of the season have made it possible for the farmers to put in telephones and necessities in the electrical line.

F. E. Marsland, 190 West Broadway, New York, is engaged in the manufacture of enameled iron signs, with particular reference to the telephone trade. His signs are to be seen all over the country, and our telephone readers will find his work effective and unique. Many thousands of the signs made by Mr Marsland are in use in all parts of the country. There are a great many people who "seeketh after signs" when looking for a public telephone—and a hint to the wise should be sufficent.

"Quarter of a Million Horsepower of Polyphase Electric Transmission Apparatus," is the title of a beautiful booklet just issued by the Westinghouse Electric and Manufacturing Company, Pittsburgh. The cover is embellished with an artistic decoration in colors, and the illustrations and presswork of the booklet are of the highest class. The information given covers a few of the best known Westinghouse plants, and refers to 185 of these in 29 states and eight foreign countries. The distance over which the current is transmitted ranges from one to 78 miles. The facts given about electric transmission, as exemplified in these representative plants, are of interest and value.

The Committee on Exhibits, at the third annual convention of the Association of Fire and Police Telegraph Superintendents and Municipal Electricians, have rendered the following report:

To the International Association of Fire and Police Telegraph Superintendents and Municipal Electricians: The undersigned, a committee instructed to report on the exhibit of the auxiliary fire-alarm and the new cable of the Montauk Multiphase Cable Company, as adapted to the system of the Gamewell Fire-Alarm Telegraph Company, beg leave to report as follows: We find properly located and connected up one fire-alarm box, arranged so as to be operated from an auxiliary sub-station; also the proper arrangements and connections for automatically sending in an alarm of fire by means of multiphase cable, a fusible wire being burned through or cross-connected by contact with a slight blaze or fire, such as a match might cause. On the application of a very slight fire from a match the multiphase cable was cross-connected, thus throwing on an additional current of electricity; the composite wire was melted, thus opening properly another line, relieving a light current which has previously been in operation. By these simple means the main box was pulled, the alarm struck on a local gong attached to the circuit, a warning bell rang to indicate that the line was in operation, and the instantaneous sounding of its alarm showed that all claims as to the merits of the purpose and operations of the apparatus have been fulfilled. It is simple in action, and reliable as a fire-alarm adjunct The Montauk multiphase cable is practically a substitute for a thermostat, and this cable being run in out-of-the-way places, or in dangerous localities in buildings where fire is liable to occur, really makes a continuous thermostat, ready at all times for action, in case of fire or dangerous heat at any point where the cable runs.

The committee was constituted as follows: William Brophy, Inspector Wires, Boston, Mass.; M. W. Mead, Superintendent Bureau of Electricity, Pittsburgh, Pa.; Geo. F. MacDonald, Superintendent Fire-Alarm, Ottawa, Canada; F. C. Mason, Superintendent Police Telegraph, Brooklyn, N. Y.; W. N. Thompson, Superintendent Fire Telegraph, Richmond, Va. These gentlemen, being all professional experts and nationally well known, render any action taken on their part of value and interest to the profession at large. Their action denotes their approval of an important progressive step and great advance in fire-alarm protection.

The American Electric Telephone Company, Canal street, Chicago, is sending notices to the independent telephone companies generally, as follows: "The recent decision in Pittsburgh against the Western Te ephone Construction Company's bridging bells does not in any way affect the American Multiple Bells. In fact, it leaves the American system about the only one available that does not infringe patents owned by the supposed 'great monopoly.' This is another demonstration of the soundness of the American Electric Telephone Company's patent policy. Moral: Don't rush into trouble; buy American apparatus." This company is doing a particularly large business among independent companies, and its apparatus is meeting with favor in all directions.

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The City of Huntington, W. Va., will, on October 1, 1898, let the contract for lighting the City of Huntington with 75 arc lights of 2,000 c. p. to burn all night and every night. Two bids wanted; one for five years, one for ten years. City to furnish one side of all streets for placing poles, lines, etc. The City Council reserves the right to reject any or all bids.

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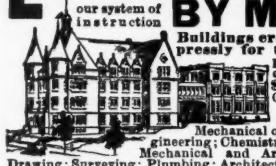
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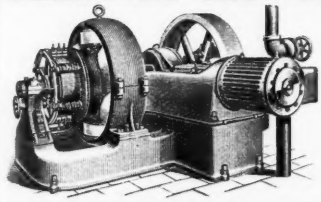
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